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A MONTHLY REVIEW OF VETERINARY SCIENCE

Est. 1826

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The Veterinary Journal.

SEPTEMBER, 1934.

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SEPTEMBER, 1934.

Obituary

PROFESSOR CARL OLAF JENSEN.

THE news of the death, at the age of seventy, of the distinguished veterinarian, Professor Jensen, will be received with deep regret, not only by his colleagues in the Danish Veterinary College, but by the whole world of science, medical as well as veterinary, for he was as well known in the one branch as in the other. He was the recipient of the high honour of an honorary University M.D. as a reward for valuable work done. Graduating from the Royal Veterinary and Agricultural High School in Copenhagen in 1882, Jensen commenced his veterinary career as a country practitioner, but in 1884 returned to the school as assistant to Professor Bang. On Professor Bang's recommendation, in 1889, he was appointed Professor of General Pathology, a post over which he held more or less control until shortly before his death. It was whilst in command of these well-equipped pathological and bacteriological laboratories that he published numerous articles on cancer and other malignant tumours, frequently working in collaboration with colleagues in the similar branch in human medicine. His researches on the transplantation of carcinoma in mice and rats have become widely known, and have formed the basis of much original work of this kind in other animals and man in all countries; and many laboratories are working at the present time with tumour specimens whose original source was Jensen's laboratory in the veterinary school at Copenhagen. In 1909, Professor Jensen gave up his duties as a teacher and took over the post of Director of the new State Veterinary Serum Laboratory which had been built and equipped by the Government at his instigation. As a result of the research done here under his direction, numerous diseases of the calf, sheep and pig have been successfully combated, and his pioneer work has led to the saving of hundreds of thousands of pounds to the farmer and stockowner in all countries. His colleagues in human medicine recognised his merit in 1910 by conferring upon him the honorary degree of M.D. of the University of Copenhagen; and his British colleagues elected him, in 1914, to the highest honour the Council have the power to confer, *i.e.*, the Honorary Associateship of the Royal College of Veterinary Surgeons.

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Editorial

A SPECIAL EDUCATIONAL NUMBER.

THIS month is an especially appropriate one in which to draw attention to the work through which the young aspirant to a veterinary career has to pass before obtaining the coveted diploma which entitles its owner to assume the appellation of "Veterinary Surgeon."

Much progress has been made since the day when a six months' course was considered sufficient for the absorption of sufficient knowledge to enable one to diagnose and treat all the diseases to which animal flesh is heir. It was soon found that the six months was much too short a period in which to really accomplish anything, and the time was doubled.

The pioneer efforts of the Odiham Society and the original Committee of Agriculturists and Medical Men which resulted in the establishment of the Royal Veterinary College in London, and, at a later date, combination with the Highland and Agricultural Society of Scotland (which also granted a diploma entitling the recipient to legitimately practise the veterinary art), succeeded in firmly laying the foundation of our present status. The six months became twelve ; this again was in turn soon converted into two, three, and then four years ; and now the course means a minimum of five—and strenuous years these are, too—with a break into the sixth year for the University degree.

Further particulars as to the subjects necessary to be studied at the present time are given in as concise a form as possible in our further pages, and to them we refer the parents or guardians of any prospective students who desire to enter the portals of the profession.

A SPECIAL SHEEP NUMBER.

CONTINUING with our quarterly plan, the October issue will be given over entirely to matters of interest connected with sheep. Not only will a number of diseases be dealt with by scientific veterinary workers, but the points of value of the principal breeds will also be described by expert writers for the edification, perhaps mainly, of the student (and we are all students nowadays), and also to brush up (in some cases, at any rate) the almost forgotten college teaching in zootechny and animal husbandry of the graduate. The recent long drought of the past spring and summer has brought the subject of sheep into especial prominence, not only in the eyes of the veterinarian, but also in the eyes of the public, and many agriculturists and breeders have suffered unavoidable ruin. The work done by Gaiger, Dalling, Russell Greig, Montgomerie, Lyle Stewart and other veterinary research workers has already borne much good fruit in controlling certain sheep diseases in which the percentage of deaths has been reduced in consequence from as high as 60 to 70 per cent. to almost *nil*.

A tribute to what veterinary research workers can do if given adequate opportunity.

General Articles

THE TRAINING OF THE VETERINARY STUDENT, AND THE FUTURE PROSPECTS.

At this season of the year the thoughts of anxious parents whose sons or daughters desire to adopt a professional career in one or other branch of medicine are, of necessity, turning towards the entrance portals through which the candidates must enter before embarking upon the respective careers which they have selected to adopt. As the veterinary profession is very much in the public eye at the present moment owing to the part it must play in the forthcoming pure-milk campaign, the allotment of a portion of The Veterinary Journal to the publication of a brief *résumé* of what is necessary to pass through before the Diploma of Membership of the Royal College of Veterinary Surgeons (or higher University degree) can be obtained, will not be out of place.

The day of the rule-of-thumb practitioner has passed from veterinary medicine just as much as it has passed from the human branch, and scientific reasoning is as essential in the treatment of the diseases of animals as it is in the treatment of the diseases of man. The old adage which states that " prevention is better than cure " applies to an even greater degree in Veterinary Public Health than on the human side, and our powers to deal with animal epidemics are more drastic ; and one must not forget that many of our animal diseases are contagious to man. As a groundwork, the school education of the veterinary student is on exactly the same plane as for human medicine, law, or any of the learned professions, and a list of the necessary Entrance Examinations can be obtained upon application to Dr. Fred Bullock, LL.D., the Registrar of the Council of the Royal College of Veterinary Surgeons, 10, Red Lion Square, London, W.C.1.

Needless to say that it is of advantage for the intending student to have passed an entrance examination of University Matriculation standard; as, although the course of study is thereby prolonged by another six months, the candidate who has taken this course will find the advantage, when applying for any position of importance, of having taken the B.Sc. degree. The Diploma must not be awarded to anyone under twenty-one years of age, and the minimum age at which a student is permitted to commence the course of studies is sixteen.

Having matriculated, the next vital point is the choice of a College at which to study, and here the selection must to some extent be guided by sentiment and reason, with a consideration, in many cases, of the amount of worldly wealth which the above-mentioned parent possesses, or is prepared to spend.

The Course of Training.

The teaching colleges are five in number, and in so far as the results are concerned, the place of graduation does not matter, for the veterinary profession

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jealously guards its "one portal" system; and the intending graduate can only become M.R.C.V.S. by the approval of the Board of Examiners, who are ambulatory, travelling twice a year and examining the students at each and every College in due rotation. The Examiners are appointed by the Council of the Royal College of Veterinary Surgeons, who are the controlling body of the affairs professional as well as educational of the profession. The respective addresses of the authorised training Colleges are as follows, and a letter addressed to the respective Secretary of any one will bring back the required information as to fees, dates of terms, etc.: The Royal Veterinary College, Camden Town, London, N.W.1.; The Royal (Dick) Veterinary College, Summerhall, Edinburgh; The Glasgow Veterinary College, Buccleugh Street, Glasgow; The Veterinary College of Ireland, Ballsbridge, Dublin; The Veterinary School, University of Liverpool. The courses taken at any one of these will qualify the successful candidate for the Diploma of the Royal College of Veterinary Surgeons (M.R.C.V.S.), the possession of which is the only "hall mark" entitling a man or woman to be legally described as a "veterinary surgeon." The Colleges in London and Glasgow each give special courses qualifying for the B.Sc. degree in veterinary science in the London University; and the Universities of Edinburgh and Liverpool, too, afford similar respective privileges to their own students. Following on this there is the M.Sc., and, finally, a Doctorate in Veterinary Science, in each case.

Cambridge University has also now decided to award a post-graduate Diploma in veterinary science, a certain amount of the course for which can be taken in Cambridge itself; and graduates in human medicine are allowed to omit a portion of the first year of study; but wherever the aspirant for a veterinary career desires to commence his studies, he must always recollect that although a University degree is a most useful adjunct, the *only* qualifying diploma which entitles a person to practise under the appellation of "veterinary surgeon" is the diploma awarded by the Examining Body of the Royal College of Veterinary Surgeons; so that this must always be obtained first. Women have been eligible on equal conditions with men for the Diploma since the passing of the Sex Disqualification (Removal) Act, 1919, and are admitted in the London, Liverpool, Glasgow and Dublin Colleges.

Cost of Training.

The tuition fees at the various Schools for the Diploma course range from approximately £27 to £30 per year, to which must be added the cost of instruments, microscope, books, examination fees, library and athletic club subscriptions, and, of course, maintenance. The cost of this, naturally, must vary with the taste and length of pocket of the individual student or his guardian. Some live at home, if this is convenient, and some in private apartments; but wherever residence is possible in a University Hostel, this gives an opportunity to mix with congenial companions who are studying for other professions; and many useful and life-long friendships have commenced under these circumstances.

The following table, drawn up by a Special Educational Committee selected by the Council of the Royal College of Veterinary Surgeons, shows clearly the course of instruction and the order of the professional examinations:

Course of Instruction.	Examination.
First Year.	*First Year.*
I.—Chemistry, Physics.	I.—Chemistry, Physics.
II.—Biology: Botany, Zoology.	II.—Biology: Botany, Zoology.
III.—Animal Husbandry (I).	
Second Year.	*Second Year.*
I.—Physiology, Biochemistry.	I.—Physiology, Biochemistry.
II.—Histology, Embryology.	II.—Histology, Embryology.
III.—Anatomy.	III.—Animal Husbandry (I).
IV.—Animal Husbandry (I).	
Third Year.	*Third Year.*
I.—Anatomy.	I.—Anatomy.
II.—Pharmacology and Therapeutics, Toxicology, Practical Pharmacy.	II.—Pharmacology and Therapeutics, Toxicology, Practical Pharmacy.
III.—Animal Husbandry (II).	III.—Animal Husbandry (II).
Fourth Year.	*Fourth Year.*
I.—(A) Veterinary Pathology (including Morbid Anatomy, Pathological Histology, Bacteriology, Mycology, and the study of filter-passing viruses in relation to diseases and other morbid conditions of domesticated animals).	I.—(A) Veterinary Pathology (including Morbid Anatomy, Pathological Histology, Bacteriology, Mycology, and the study of filter-passing viruses in relation to diseases and other morbid conditions of domesticated animals).
(B) Methods of Clinical Pathology.	(B) Methods of Clinical Pathology.
II.—Veterinary Parasitology (including Protozoology, Helminthology, and Entomology).	II.—Veterinary Parasitology (including Protozoology, Helminthology, and Entomology).
III.—Veterinary Medicine (including Clinical Parasitology).	
IV.—Veterinary Surgery (including Clinical and Operative Surgery, Surgical and Applied Anatomy, Examinations for Soundness, Pathological Shoeing).	
V.—Clinical Instruction.	
Fifth Year.	*Fifth Year.*
I.—(A) Veterinary Medicine (including Clinical Parasitology). Special Therapeutics.	I.—(A) Veterinary Medicine (including Clinical Parasitology). Special Therapeutics.
(B) Meat Inspection.	(B) Meat Inspection.
II.—(A) Veterinary Surgery (including Clinical and Operative Surgery, Surgical and Applied Anatomy, Examinations for Soundness, Pathological Shoeing).	II.—(A) Veterinary Surgery (including Clinical and Operative Surgery, Surgical and Applied Anatomy, Examinations for Soundness, Pathological Shoeing).
(B) Obstetrics.	(B) Obstetrics.
(C) Jurisprudence.	(C) Jurisprudence.
III.—Clinical Instruction.	

In addition, the final-year student is required to produce clinical evidence, by carefully taken notes and the signed statements of his (or her) preceptor that he (or she) has seen at least six cases of parturition in the larger animals.

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The B.Sc. aspirant has a further six months period of study before being allowed to be examined for this degree, which is of unquestionable advantage as an adjunct in applying for certain positions, especially those of an academic nature. Every student, therefore, who has passed matriculation (or equivalent acceptable to the University) while still at school is strongly recommended to read for the combined course. The fees are necessarily higher than those for the Diploma course itself; *e.g.*, at Liverpool the dual course costs £35 per academic year, while the Royal Veterinary College student who reads for the London B.Sc. in Veterinary Science pays, in addition to the usual College fees, a sum of £15 per year to cover tuition in organic chemistry, biology and veterinary physiology.

The degree course can be taken concurrently with that for the Diploma, and copies of the papers previously set in the several Examinations may be obtained from the Secretary of the Royal College.

Exemptions.—Graduates in Arts, Science, Medicine or Agriculture, and certain others are exempted from the first year course and examination. This privilege is extended to matriculated students in Arts, Science or Medicine who have passed an approved University examination in chemistry and physics, botany and zoology.

Examination Fees.—The fee payable to the Royal College is Six Guineas for each examination (or Three Guineas for re-examination if unsuccessful on any occasion). Exempted students referred to in the preceding paragraph pay a special fee of Ten Guineas for the second Examination.

The Registration Fee on admission to membership is Five Guineas; a fee of One Guinea is afterwards payable annually to the Royal College of Veterinary Surgeons by every practising Member.

Scholarships and Prizes.

Certain Scholarships and Bursaries are awarded, either by the Colleges themselves, or by Local Authorities or special Foundations such as (in Scotland) the Carnegie Trust. The Ministry of Agriculture awards to the sons and daughters of agricultural workers, or to those who have themselves been engaged on agricultural work, Senior Scholarships enabling the holder to take a Degree or Diploma Course in Veterinary Science. The amount granted is based on individual circumstances, and may include, in addition to the value of the tuition and examination fees, an outfit allowance, and a maintenance allowance not exceeding £150 or £200 per annum for three or four years. Special regulations apply to secondary school pupils who have passed a recognised Higher School Certificate Examination and desire to read for an Honours degree. Applications should be made by those interested to the Ministry of Agriculture, Whitehall Place, London, S.W.1, or to the Local Authority, for Circular, Scholarships I.

There are valuable post-graduate scholarships awarded by the Royal College of Veterinary Surgeons and the various individual colleges, tenable for varying periods, and intended mainly for those engaged in research work.

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The Agricultural Research Council awards annually two Veterinary Research Fellowships, value £300 per annum, open to holders of the Diploma of M.R.C.V.S. and tenable for three years. Nomination forms and further information may be obtained on application to the Secretary, Agricultural Research Council, 6a, Deans Yard, Westminster, London, S.W.1.

Prizes are awarded by the Royal College of Veterinary Surgeons and the National Veterinary Medical Association; and Medals, Certificates of Merit, etc., by the affiliated Colleges, on the results either of the several professional or special examinations.

Post-Graduate Qualification.

In addition to the University degrees already alluded to, there are certain post-graduate diplomas, each involving a further course of about six months special instruction in Veterinary Public Health and Tropical Veterinary Medicine respectively. The former is especially intended for those who intend to devote their lives to State Veterinary Service, and the latter is for men who enter the Colonial Service or desire to practice in the Tropics. The course for each—Veterinary State Medicine (D.V.S.M.) or Tropical Veterinary Medicine (D.T.V.M.)—is arranged by the Royal College of Veterinary Surgeons. There is also a course arranged for the former (D.V.S.M. Vict.) by the authorities of Victoria University, Manchester, and Edinburgh University awards a Diploma in Tropical Veterinary Medicine, whilst the University of Liverpool offers a post-graduate Diploma in Veterinary Hygiene (D.V.H.) The Fellowship examination (F.R.C.V.S.) can be taken by Members over twenty-three years of age who have been in practice for at least two years, and is especially intended for the up-to-date and more progressive practitioner who desires, someday or other, to become known as a Consultant. Particulars for all these courses, fees, etc., can be obtained on application to the Registrar, R.C.V.S., 10, Red Lion Square, London, W.C.

The Prospects of the Profession.

Contrary to what the outside observer, who in days gone by could only associate veterinary medicine with the doctoring of horses, might think, there is no profession at the present moment which is less crowded than that of the veterinary surgeon; and although the horse has certainly to a large extent been displaced by the motor as a means of transport, the dog has, in the cities, taken its place in the day book of the practitioner. In the country much more attention is now paid to the condition of the dairy cattle supplying milk for infants and invalids, and England is at last awakening to the common-sense fact (which has been acted upon for many years in Continental countries and our Colonies) that the one who knows most about the diseases of the animals which produce meat and milk for the food of man should be (and is) the properly qualified veterinary surgeon. This means that many veterinary graduates are now (and will be for another ten years) needed as guardians of the public health in the inspection

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and control of the supplies of meat and milk. These positions command salaries in the junior posts from an average of £400 rising to £500 or £600 a year, or in the senior positions averaging at the commencement from £750 to £800 and rising to £1,000, £1,200 or even £1,500, with the customary allowances for travelling and other expenses. Not perhaps a fortune, but quite a comfortable livelihood; especially as it is a healthy life, chiefly in the open air; as is shown by observation on the ages which appear in the obituary lists. No profession can ever give the enormous incomes which are occasionally made in commerce; but for a boy or a girl who loves an open-air life, without monotony (for every patient has its own peculiar phases), who has a genuine love of animals (which naturally engenders a desire to help them when sick and helpless), there is no profession at the present time in which there are more openings. Many town practices are very lucrative, and when agriculture is put upon its feet the country practitioner (who can get plenty of patients, but has difficulty in obtaining the fees for his attendances from his *clientèle*) will again be a contented and prosperous man. The influx into the Colleges is so great at the present time that some of them are refusing any student under University standard, and assistants for private practice are very difficult to obtain; whilst unemployed veterinary surgeons of the modern school of teaching are as rare as the proverbial blackberry—and will be for another five or even ten years—until, at any rate, the newly organised Veterinary State Service positions are all filled up; and it most not be forgotten that even when this organisation is complete there will always be the necessary supply needed behind it to fill up vacancies.

The newly qualified veterinarian should not, unless conditions are extraordinarily favourable, hurry to enter into practice "on his own." He will find it advisable to take employment for a time under a first-class practitioner, with or without a view to ultimate partnership.

Ministry of Agriculture and Fisheries.

The Ministry of Agriculture and Fisheries appoint from among members of the Royal College of Veterinary Surgeons of the ages of twenty-one to thirty-two, a number of Assistant Veterinary Inspectors on a salary scale of £300–£15–£500. After two years' probation a special examination in pathology and the Diseases of Animals Acts and Orders must be passed, though candidates holding the Diploma in Veterinary State Medicine are exempted from taking the former subject. Promotion is afforded to the grades of Divisional Inspector, £500–£600, and to Superintending Inspector, £600–£800, with allowances in each case. The department is controlled by a chief veterinary officer and the staff is under the usual Government regulations as regards pension on retirement.

The Ministry has its own Veterinary Research Laboratory at Weybridge, where it undertakes both general research work into animal disease, methods of diagnosis and preparations of vaccines, and inquiries into the origin and appropriate treatment of specific maladies. In addition, there is an experimental station at Pirbright, and there are Veterinary Research Laboratories, which receive

Government support, in various parts of the country, all of which are staffed by qualified veterinary scientists. The chief of these are the Animal Research Institute of the Royal Veterinary College, the Institute of Animal Pathology at Cambridge, and the Moredun Institute in Edinburgh. To quote one example only: The veterinary research workers of the latter in particular have saved the agriculturist and stock breeder hundreds of thousands of pounds as the results of their researches into certain diseases of sheep and cattle.

At Weybridge, too, there is the Imperial Bureau of Animal Health, by which the veterinary staff keep in touch with the most up-to-date research literature.

There are also openings for veterinary specialists in biochemistry, physiological, pathological and bacteriological research and such like subjects, in the laboratories of institutions such as the Medical Research Council, the London School of Tropical Medicine and Hygiene, the Wellcome Laboratories, etc., the field in this respect being almost unlimited and depending almost entirely on individual brilliancy in scientific work. The establishment of a section of Comparative Medicine in the Royal Society of Medicine, a section where medical men and veterinarians meet to discuss problems of mutual interest, has done much to establish an *entente cordiale* between the two branches of medicine; and in confirmation of the value of collaboration of this kind one cannot do better than quote the work done by Dr. Laidlaw and Messrs. Dunkin and Dalling on distemper of the dog, the technique of which has led to valuable results, not only in producing immunity for this animal against this devastating scourge, but also in supplying many hints to the workers against yellow fever and certain of the ultra-visible virus diseases of man.

The Royal Army Veterinary Corps.

Candidates for Commissions must be members of the R.C.V.S., unmarried, and between the ages of twenty-one and twenty-eight. Approved applicants take a special competitive entrance examination in professional subjects—written, oral and practical; on passing this and a medical examination, they may be appointed as Lieutenants on probation for a period of six months, or longer if deemed necessary, at a daily rate of pay of 18*s*., plus the appropriate allowances. Further technical instruction and examinations succeed, as a result of which confirmation of appointment may be effected. Promotion to Captaincy (rate of pay 22*s*. 6*d*. rising to 26*s*. per diem, with allowances) is possible after a minimum of three and a-half years' service, and to higher ranks according to the regulations. The Director takes the rank and pay of a Major-General. These appointments normally involve periods of service abroad. Officers of whatever rank, retiring with between ten and twenty years' service, are granted gratuities as under:

After 7 years' service as a veterinary officer	...	£800
After 15 years' service as a veterinary officer	...	£1,800
After 18 years' service as a veterinary officer	...	£2,500

while those with 20 years' service or over are eligible for retired pay according to rank and period of service. In all cases officers are liable to recall to service

in an emergency up to the age prescribed for compulsory retirement, according to rank held. Further particulars are obtainable from the Director-General, Army Veterinary Services, War Office, Whitehall, London, S.W.1.

India and the Colonial Services.

To those who desire to see something of the world, the profession offers considerable opportunities in the Dominions (particularly Australia and New Zealand) and in the Colonies (especially East and West Africa and the Orient). Among the Dominions, however, Canada, South Africa and Australia have their own veterinary colleges. The veterinary surgeon holding the British qualification will, as a rule, be required to comply with the Dominions regulations as to registering, before practising there.

Veterinary Services in India.—Recruitment for the veterinary services in India has passed from the Imperial Government into the hands of the Provincial Governments, and copies of the regulations in respect of several of the provincial veterinary services may be seen on application to the High Commissioner for India, India House, Aldwych, London, W.C.2.

New Zealand.—In New Zealand, official recognition of the professional status of veterinary surgeons has been afforded by the passing of the Veterinary Surgeons Act, 1926. Apart from a few who have Canadian or Australian qualifications, every qualified veterinary surgeon in New Zealand holds the R.C.V.S. Diploma. There is not room for any great number of veterinarians with small and localised practices such as exist in this country. The great extensions of dairy farming in recent years have considerably increased the scope of the veterinarian. Meat and milk inspection are under the control of the central Department of Agriculture, and of the fifty-five or sixty practitioners with recognised qualifications, over thirty are in the Department's employ. Particulars can be obtained from the Office of the High Commissioner for New Zealand, 415, Strand, W.C.2, and personal qualities as well as academic attainments are taken into consideration in effecting the selection. Commencing salary is £380 per annum, rising to £450, and in the higher grades to £478 and £600. The Chief Administrative Staff posts, of course, command higher salaries.

Australia.—Australia has one Veterinary College attached to the University of Sydney ; and the veterinary officer is mainly concerned with the administration of official regulations relating to the health of animals in the mass and the prophylaxis of outbreaks of disease.

The Colonial Veterinary Service.—Agriculture, with stock raising, is in most of the Dependencies the foundation of the country's wealth ; and in the Tropics, in which eleven-twelfths of these Dependencies lie, the maintenance of animal health exerts a far greater influence on the general health of the community than in temperate regions ; and some 150 veterinary officers are at present employed by the Dependencies, which are administered under the direction of the Secretary of State for the Colonies. A Colonial veterinary officer, unless he is employed

on research, is mainly concerned with the enforcement of regulations affecting animals in the mass ; and as it is frequently necessary for him to enforce regulations which are unfamiliar to the local population and may conflict with their prejudices or with the interests of individuals, personal qualities, such as tact and determination, are of the highest importance. Commencing salaries at present range from approximately £600 to £700 per annum, plus certain allowances, according to the Colony and to the class of work. Appointments are pensionable, subject to a probationary period of three years.

The Colonial Office recently had these services under review ; and a Committee, under the chairmanship of Lord Lovat, recommended a scheme of reorganisation designed to attract candidates of the highest professional and personal qualifications. The growing need is for general scientific as well as for veterinary technical knowledge ; and the report therefore proposed the granting of Scholarships to the value of £250 per annum to selected candidates who are either : (*a*) University Graduates in Pure Science—for three years in order that they may qualify for the M.R.C.V.S. Diploma ; (*b*) holders of such diploma and a degree in veterinary science—for two years in order that they may take a further degree or conduct research under approved conditions ; or (*c*) holders of the diploma only—for two years in order that they may qualify for a degree in some special biological subject. Three or four such Scholarships are now being awarded annually.

Recommendations are also made for the establishment of a School of Tropical Veterinary Science in London, at which the newly recruited officer may receive post-graduate instruction in professional and allied scientific subjects ; to be supplemented by a brief period of laboratory study in tropical animal disease in the Colony before he assumes his appointment. The institution in some suitable Colony of a central research station for long-range research on behalf of the Colonial Veterinary Departments as a whole is also recommended.

The Lovat Committee ultimately envisage a unified Colonial Veterinary Service under which officers may be transferred from branch to branch and from Colony to Colony as occasion may demand. The proposed salary, if these provisions of the report were adopted, would range from £600–£30–£750 for Class VII to £2,000–£50–£3,000 for Class I. Further particulars concerning these appointments may be obtained from the Director of Recruiting, Colonial Office, 2, Richmond Terrace, London, S.W.1.

The Part Played by the Woman Graduate.

The most lucrative opportunity for women practitioners lies mainly in private practice amongst the smaller animals ; and a practice in a large residential or seaside fashionable town, or in a growing residential district, affords great scope in which to specialise in this branch. There is, moreover, room for an expansion of present work amongst the fur-bearing animals, and in relation to poultry and cage-bird diseases. In such work the woman veterinary surgeon will find lucrative and interesting occupation. There are now over forty women graduates, and this

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much-talked-of innovation has now got long past the pioneer stage. They have, too, a very definite opportunity in laboratory work, and several have already grasped their opportunities in this direction.

Consultants and Specialists.

As in human medicine, there is a limited but definite field for the older men of experience to specialise in one or more branches of veterinary medicine or surgery, especially the latter, and their services are sufficiently in demand as consultants with their brother practitioners to create a very lucrative and pleasant field of practice when middle age has made a rushing and very active life somewhat irksome. Some specialise in equine or canine work respectively, some make their mark in surgery alone, whilst others have a reputation for skill in legal acumen when in the witness box. Others patiently take up some field of research, but whichever it may be, the profession has a useful place for such men, and many young practitioners (and some of the older ones, too) have had cause to be grateful for the intervention of a tactful and sympathetic consulting specialist, whose greater experience in the particular ailment from which the patient is suffering has been able to evolve a sequel which has pleased both practitioner and owner; and shown the way, too, to restore the patient to health and utility again.

Bibliography.

For further and more complete details as to the Acts and Charters governing the etiquette, etc., of the profession, one cannot do better than refer the anxious inquirer to the following handbooks, all of which can be obtained from Messrs. Baillière, Tindall & Cox, Henrietta Street, Covent Garden, London, W.C.1: "The Register of Veterinary Surgeons," price 5*s*., post free. "The Handbook for Veterinary Surgeons," by Dr. Fred Bullock, LL.D., price 5*s*. 4*d*., post free; and "The Law Relating to Medical, Dental, and Veterinary Practice," by Dr. Fred Bullock, LL.D., Price 12*s*. 6*d*. net.

Details of Examination requirements, etc., can be obtained from the Secretary of the Royal College of Veterinary Surgeons, 10, Red Lion Square, London, W.C.1, and Calendars of the respective Veterinary Colleges, giving full details of courses, will be sent on application to the Secretaries of the Institutions concerned.

THE CANINE INTERNATIONAL CONGRESS.

A CANINE International Congress was held under the auspices of the Canine Society of Monaco on March 21st–23rd, 1934. Among the subjects discussed was the feeding of dogs. The papers on this subject were summarised by Docteur-Vétérinaire Mennerat (Paris). The following is a translation.

Introduction.

Eleven papers were received from experts of eight countries. They are as follows: Germany, Docteur C. Roesebeck; Belgium, Docteur F. Liegeois; France, Monsieur le Comte d'Andigné, Docteur-Vétérinaire Mennerat, Professeur H. Simonnet; Great Britain, Mr. A. Cornish-Bowden; Italy, Professeur R. Giuliani;

Monaco, Docteur-Vétérinaire J. M. Balaud ; Roumania, Professeur G. Nichita ; Czechoslovakia, Professeur C. Kucera ; Holland, Professeur A. Klarenbeck.

Although the dog has been used as the experimental animal in physiological studies on digestion for a long time, only few of the results have had practical application. Professor Giuliani points out with justification how the various findings regarding the researches into digestion of the dog have been misapplied even by expert and intelligent breeders. The choice of the feeding of dogs as a subject for discussion at this Congress is a wise one, for both scientists and dog breeders can take part. This is very necessary because of the different types of dogs and conditions of life to which they are submitted. It is my intention to present my summary of the papers in a language easily understood by all parties. I would be neglecting my duty if I did not point out that in addition to the great service rendered to dog breeders and dog keepers by scientific experiments, the experiences of the practical man are always of the greatest value.

For dogs, as well as for all animals, it is not sufficient that feeding is carried out simply for the sustaining of life ; it must also be such that perfect growth takes place, that diseases are prevented, and that normal reproduction may occur. I cannot do better than sum up the qualities of feeding by quoting Mr. Cornish-Bowden : " Feeding should be the means of producing the most perfect specimens."

(1) Facts Regarding Foods.

All foods, whether of animal or vegetable origin, are composed of simple substances. Some are used for the building-up and the repair of body cells—these are the plastic foods. Others supply energy and are referred to as energy supplying foods. Plastic foods comprise : (1) proteins (muscle, egg albumin, milk casein) ; (2) fats (fats and oils of animals and vegetables) ; (3) minerals (*e.g.*, sodium chloride, calcium, phosphorus, iron, etc.) ; (4) water, which constitutes about 60 per cent. of the body tissues. The function of water, as particularly referred to by Mr. Cornish-Bowden, is most important—dogs may lose up to one-half of their total fat or protein without death occurring, but if they lose one-tenth of the water in their systems they succumb.

Energy-producing foods comprise : (1) carbohydrates (starches and sugars), their function is chiefly the production of muscular energy ; (2) fats, in addition to being plastic foods, are heat producers and act as food reserves ; (3) vitamins, which are intimately connected with the utilisation of the preceding food elements. Professor Simonnet, whose work on vitamins is known all over the world, presents a paper on the subject at this Congress.

Proteins, carbohydrates, fats, minerals and vitamins are the component parts of foods and exist in foods in various proportions, sometimes some are absent. These substances in animals are bound together to form tissues, etc., usually by connective tissues ; in vegetables they are encased by special envelopes and by fibres composed of cellulose. Foods can be examined chemically, and so the actual composition of the feeding of any given dog can be ascertained ;

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tables giving the various compositions are available. Proteins are mostly found in foods of animal origin (meat, fish, milk, eggs); carbohydrates are found mostly in foods of vegetable origin (cereals, starches, sugars); while fats, minerals and vitamins are found in both types of food. I shall now indicate how these food elements are utilitsed by the digestive system of the dog.

(2) Digestion in the Dog.

As in all carnivores, the teeth of the dog are of the type suitable for tearing and crushing meat and bones. The stomach is large in comparison with the intestine. The dog does not possess any large compartments in its intestine similar to the cæcum and colon in herbivora. The liver of the dog is very large. The physiology corresponds to this special anatomy. The salivary glands have an insignificant rôle to play; thus in the dog 100 grams of saliva are secreted in twenty-four hours, while in the horse as much as 40 litres are secreted (Colin). It must be remembered that one of the main functions of saliva is concerned in the digestion of carbohydrates.

The stomach secretes an abundance of highly-concentrated gastric juice which has as its function the digestion of proteins. The quantity secreted indicates the type of natural food of the dog. Experiments have shown that a dog weighing 30 kilos can easily digest 5 kilos of meat. In connection with gastric digestion in the dog, Professor Kucera found that because of its acidity the gastric juice is unsuitable for the digestion of proteins of vegetable origin; this would indicate that foods of vegetable origin containing much protein, *e.g.*, leguminosæ, are not suitable for the feeding of dogs. The dog's liver secretes bile abundantly, which is necessary for the digestion of fats. In the intestine the final digestion of proteins, already subjected to the action of the gastric juice in the stomach, takes place. The digestion of carbohydrates is carried out quickly in the intestine because there are no storage facilities. In herbivora and omnivora cellulose plays an important part in the intestine. As dogs have no facilities for the storage of cellulose, Professors Simonnet and Nichita consider that the part of indigestible residue in the dog should be played by bones.

(3) Study of the Papers Presented.

The important points in the papers were: (1) Those on which there was complete agreement and which may form a basis for the guidance of dog rearers; (2) those on which there was disagreement and regarding which the experiences of dog breeders, etc., will provide the true solution.

Facts on which there is Agreement.

(1) *Raw Meat.*—Raw meat provides the best source of proteins for the dog, and it is completely digested. In connection with this I would cite Dr. Roesebeck (Germany) and Dr. Vet. Buttin and Comte d'Andigne (France), who have considerable experience in rearing dogs and who say: "Best results in rearing dogs can only be obtained by the feeding of abundant quantities of raw meat." (Note.—By raw meat the author means

muscle, bone, organs, etc.). If there are some who disagree with this, we would say with Professors Simonnet, Kucera and Nichita, that carnivores should be maintained on " complete " meat, *i.e.*, muscle, bones, viscera, glands and blood if possible. Why ? Because in these different organs there exists certain substances—vitamins, mineral salts or secretions—which are not found in muscle, and which the dog must have. In connection with cooked meat, it will suffice to recall the experiments of Richet and Mouceaux, who showed that dogs fed on cooked meat eliminated more phosphorus and chlorine and passed four times the amount of urine than dogs fed on raw meat. These experiments demonstrate the bad results attending the feeding of dogs, especially during their growing stage, on cooked meat. I have shown, and Dr. Vet. Balaud confirms, that it is best to feed raw meat in lumps. This means a longer sojourn of the food in the stomach—thus better digestion. Meat cut up finely has not the same effect, while dried or powdered meat has only an inferior nutritive value.

The experts are in agreement in recommending the feeding of raw meat to young dogs even before weaning. Dr. Roesebeck and Mr. Cornish-Bowden point out the good results of raw meat on the puppies by feeding it to the mothers.

(2) *Carbohydrates.*—In opposition to the perfect digestion of raw meat, it is only with difficulty that carbohydrates can be digested by the dog. It is possible to aid such digestion by prolonged cooking of carbohydrates and feeding them dry. By such a process carbohydrates fed in the form of well-cooked cereals are able to be digested by the dog. Sugars are useful in the feeding of dogs. As sugars lessen the secretion of gastric juice they should not be fed soon before or after the meat feed.

(3) *Milk.*—The opinions of all authors are not agreed on the subject of feeding milk. Cow's milk is three times richer in protein and fat than that of the dog, while the latter contains twice as much carbohydrate (lactose). In 1927, I showed that puppies reared exclusively on cow's milk grew only half as well as did other puppies. These results were confirmed by Drs. Roesebeck and Balaud. These facts are easily explained if one remembers that the puppy must, to receive the necessary nutriment, partake of a quantity of cow's milk each day equal to its own weight. Further, the amount of lactose in cow's milk prevents assimilation of calcium. Professor Kucera points out the bad effects of cow's milk and of dairy bye-products in feeding dogs, and blames this method of feeding for the degeneration of the " Braque de Lombardie " type of dog. Several authors point out that the addition of fresh eggs to cow's milk in the proportion of one egg per 60 grams milk produces a mixture of nearly the same composition as bitches' milk. Good results from its use in the feeding of breeding bitches are recorded.

(4) *Mineral Salts.*—All the experts agree on the necessity, especially for puppies, of food rich in phosphorus and calcium. Because bones are largely composed of phosphorus and calcium and because of the rapid rate of growth of puppies it is very necessary that their food contain large amounts of these two minerals. Other minerals (iron, sodium, potassium, etc.) are equally indispensable.

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(5) *Vitamins.*—Professor Simonnet has given close study to the question of vitamins and their great value in rearing dogs, especially in connection with breeding. Though the results of his experiments are beyond reproach, he does not hesitate to add: "No matter what these results may be, they cannot be taken as of value till they are confirmed by the practical man." Vitamins act in small quantities, *e.g.*, only one hundred millionth part of the ration may be composed of vitamins. The chief vitamins used by the dog are:—

Vitamin A.—This is concerned with the development of growth of tissues and the prevention of infectious diseases. It exists in liver, kidneys, lungs, yolk of egg, cod-liver oil. Milk and muscle contain very little; farinaceous foods none at all.

Vitamin D is concerned in the utilisation of phosphorus and calcium; it is the anti-rachitic vitamin. Recent researches have shown that the vitamin is produced by the action of the ultra-violet rays of the sun on a chemical substance called sterol, found in the body of animals and plants. Good cod-liver oil contains much vitamin D, while butter, yolk of egg and muscle tissue contain small quantities.

Vitamin E is concerned with the development of spermatozoa in the male and the placenta in the bitch; its rôle is in reproduction. Raw meat, eggs and vegetable oils contain this vitamin. It is also found in carbohydrates, but as they should be fed after cooking, this source of supply is of little value to the dog. There are other vitamins, but their actual value to dogs has not yet been established.

Subjects on which there is Some Disagreement.

Debatable problems consist in determining the quantity of food substances actually necessary for the dog, and in what proportion they should be fed. There is common agreement that attention in this direction must be paid to the breed, age, climatic conditions, etc., respecting the dog in question. The opinion I am going to give, though it may differ from that of others, may serve as a basis for the rearing of dogs. For an adult dog weighing 30 kilos the following are recommended:

(1) *Proteins.*—Professor Giuliani fixes the minimum amount at 2 grams per kilo. Count d'Andigné says 5–6 grams. This represents a ration of raw meat varying from 300 grams to 1 kilo per day. Personally, I rather agree with the Count, and I think that a suitable amount of protein for a dog of 30 kilos is 3 grams per kilo, *i.e.*, a ration of raw meat of 450 grams per day. This applies to a dog doing no work. All the experts agree that the amount of protein necessary varies indirectly with the size of the breed, and, further, that the amount must be increased considerably during gestation, nursing, and when the dog is working. But the amount suggested varies considerably. Count d'Andigné recommends 12 grams per kilo for the above-sized dog in work, *i.e.*, 2 kilos of meat per day. I would like to point out to those at the Congress the findings of Dr. Vet. Buttin, a breeder of pointers. He reared successfully by the use of raw meat only, as feeding from the point of view of the individual as well as the hereditary qualities of the dogs. (The raw meat he fed included muscle, bone, viscera, glands and blood.) Dr. Buttin showed pictures of a pointer bitch which in the fifth week

of lactation, after whelping twelve puppies and nursing them, was still as fat as on the day she whelped. Her ration was 30 grams protein per kilo per day. We have seen that the best source of protein for the dog is raw flesh. Eggs and cow's milk are also useful. Fish is recommended by Professor Giuliani. Personally, I think it is useful in feeding adult dogs, but not for growing puppies.

Fat.—There is much disagreement regarding the quantities of fat necessary for dogs. The amounts quoted vary from ½ to 6 grams per kilo. Several experts think that, as in herbivora, fats can be completely replaced by carbohydrates after weaning. Personally, I do not take this view, for I do not think that the digestive tract of the dog is suited for the digestion of carbohydrates, while the amount of bile secreted is capable of digesting large quantities of fat. In my view the proportion of proteins, carbohydrates and fat in the diet of a dog should approach as near as possible to that of the milk of the bitch.

Carbohydrates.—The amount of carbohydrate in the diet will depend on the amount of fat present, for both are energy-supplying elements. The amounts given by the experts vary from 3 to 12 grams per kilo, representing 200 to 500 grams of biscuit or 300 to 700 grams of bread per day for a dog weighing 30 kilos. This leads us to consider the value of biscuits in feeding dogs. In my opinion, biscuits made from flour of good quality represents the ideal form in which to feed carbohydrates to the dog. I agree with Mr. Cornish-Bowden regarding the value of biscuits, and am in entire disagreement with those who say that biscuits have no value in the feeding of dogs. Possibly our opponents have fed biscuits of poor quality. It should be added that all materials of a carbohydrate nature used in feeding dogs should be deprived of cellulose and fed as dry as possible. The good results obtained by Dr. Vet. Balaud in feeding flaked maize are worthy of note. Fruit and green vegetables which contain much cellulose do not appear to be suitable for dogs. As I have just shown, the amounts of the various food elements for the dog recommended vary very much.

(4) Feeding and Disease.

We have reserved for a special chapter the relationship between feeding and disease. Two papers were devoted to this subject—those of Professors Liegeois and Klarenbeck. The interesting points brought out were as follows:

(1) *Rickets.*—All the authors recognise that the essential cause of rickets is an insufficiency of vitamin D, which regulates the utilising of calcium by the tissues. Mr. Cornish-Bowden refers to an important observation of Mellanby, who showed that evidence of rickets in young dogs, especially poor calcification of the milk teeth, is caused by an insufficiency of vitamin D in the bitch. Mellanby also showed that rickets developed in dogs though receiving a perfect ration composed of meat and excess of bread. He attributes the cause to the presence of the bread. This point of view must be modified to-day, since we know that an excess of carbohydrate (bread, etc.) causes fermentation in the intestine, and so renders the salts of calcium non-assimilable. Professor Liegeois insists that there are

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secondary causes of rickets, *viz.*, bacterial or toxic intestinal infections and intestinal parasites usually found in young dogs. We must also remember the action of the lack of sunlight, for we know that vitamin D is formed by the action of sunlight on the sterols in the tissues.

(2) *Infectious Diseases.*—The feeding of raw meat plays a considerable part in the prevention of infectious diseases. In 1900, Professor Richet showed that dogs fed on raw meat were refractory to experimental tuberculosis, while dogs receiving no raw meat died when injected. Professor Kucera showed that the feeding of raw meat to young dogs increased the amount of blood and the amount of hæmoglobin. Many observers have noted that the feeding of raw meat has a definite bearing on the occurrence of distemper.

(3) *Nervous Troubles.*—Several experts refer to the relationship between the types of feeding and the occurrence of nervous troubles, *e.g.*, hysteria, eclampsia, etc. Some incriminate the lack of vitamin A, others attribute the occurrence to the feeding of certain biscuits, while others think lack of calcium is the cuase. I am of the same opinion as Mr. Cornish-Bowden, that biscuits cannot be considered the cause of these troubles.

(4) *Other Diseases.*—Other diseases—toxic, infectious or parasitic—may be caused by the food given to dogs. Full details are contained in the papers of Professors Liegeois and Klarenbeck.

Conclusions. (These will serve as a Basis for Dog Rearers.)

(1) The feeding of dogs should have as its basis raw meat (by raw meat is meant muscular tissue, bones, viscera, glands, blood, etc.). (2) There may also be included in the diet, biscuits, dry bread, rice or cereals, well cooked, and containing as little water as possible. (3) These two types of food may be fed in equal quantities. (4) The amount of the various food elements should be regulated by the dog rearer so that the dog is kept in good condition but not fat. (5) The amounts of food, especially raw meat, should be increased during gestation, lactation, the growing period, and work. (6) It is very important that the lactating bitch be well fed so that her milk will be of the quality to allow growth of the puppies. Intestinal parasites in the puppies should receive treatment. (7) Working dogs must be fed after and not before their work. (8) Kennels, especially breeding kennels, should be so constructed that there is ample exposure to sunlight.

THE FEEDING OF DOGS.*

By A. CORNISH-BOWDEN, M.R.C.V.S.
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THE wise builder has much to do and attend to before he lays his first or foundation stone. Our aim in breeding dogs or any other animal is to produce perfect specimens. Considerable thought and care are admittedly required in

* Paper presented at the Congrès Cynologique Mondial, held at Monaco, March 21st to 23rd, 1934.

the selection of suitable strains, lines and parents, but it is equally important to prepare the ground for the foundation stone, and the intending mother should have attention and preparation long before conception takes place, and the materials used must be sound and good if your aim is to be the highest and you wish to produce the best.

I wrote a paper many years ago before the realisation of what are now known as vitamins was generally contemplated, and the theme of that paper was almost prophetic in view of our present knowledge of these substances; but although the advice I gave was then good and sound, we were without the knowledge of those food accessories which we all recognise to-day as being so essential in the production and building-up of the perfect specimens we hope to produce. This paper is on the feeding of dogs, and my chief claim is that you should start to feed your puppy some weeks before its mother comes in œstrus, and that the ground should be prepared before the foundation stone is laid or the seed is sown.

Reliable physiological data on the digestion and the presence and action of enzymes in the dog are peculiarly conspicuous by their absence, and we find much contradictory evidence in standard works on the subject, and this in spite of the fact that most of our present practical knowledge on digestion generally has been obtained by experiments and research on dogs. As an example of what I mean, Starling (" Principles of Human Physiology," 1933, p. 550) states: " The main function of saliva is to moisten the food and so facilitate its mastication and deglutition. The presence of mucin is of special value for the latter process, since it renders the mass of food slippery. In animals such as dogs, where the saliva is devoid of any digestive enzyme, this must represent its sole function," and again, p. 552: " In the dog, the saliva is free from any enzymes." Against this, S. Samytschkina[1] informs us that " Diastase or starch-splitting ferment can be demonstrated in the saliva of dogs fed from four to seven days on a carbohydrate diet; on ceasing the diet the enzymes rapidly disappear." Again, we learn from Koldaer[2]: " Saliva from the parotid, submaxillary and sublingual glands of dogs contain a definite fat-splitting enzyme, destroyed at 100° C. There is no difference in the enzyme noticed, whether the dog was fed on meat, fat or bread." Whilst E. Strach[3] gives evidence to show that fats are not split up in the small intestine of the dog *but are absorbed as such.*

How can we reconcile these various facts, all of which are the findings of men who have investigated the subject and are eminently qualified to instruct us? One has therefore to fall back almost entirely on practical experience. The animal body consists of proteins, fats, salts, water and a small amount of carbohydrates. All these are needed for the upkeep of the healthy body, the amounts varying with the type of life to which the animal is subjected. The food consumed is entirely responsible for supplying the necessary amounts of these various essentials. Food, generally speaking, consists of protein, fats, carbohydrates, water, salts and vitamins, and they must be broken down into a state whereby they can be absorbed into the body through the intestinal wall and then distributed, built

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up again and made use of for their various purposes. Digestion is the process by which the food is broken up into substances able to be absorbed. For the purposes of digestion, various enzymes are secreted by the essential glands, and these act on the food and cause the necessary splitting process.

As the end result of digestion, the many kinds of food taken into the body are reduced to a fairly small number of simpler bodies. These products are (1) Carbohydrates (the mono-saccharides, glucose, fructose and galactose); (2) Fats (fatty acids or, in alkaline medium, soaps and glycerol); (3) Proteins (a great variety of mono and dia-mono acids). Water and salts undergo no metabolic alteration in the body. They pass along the alimentary canal unchanged, and if absorbed they pass without further alteration into the blood.

The glands and enzymes required for these purposes as as follows:

Salivary glands (parotid, submaxillary and sublingual) secrete saliva into the mouth. The stomach wall secretes gastric juice, certain acids and a certain amount of mucin. The liver produces bile. The pancreas secretes trypsin, anylopsin and lipase into the intestine. The intestinal wall also secretes various digestive juices.

Pavlov, in his classic work on the digestive glands, teaches us that the gastric and pancreatic glands of the dog have what at first sight appears to be a form of instinct. They possess to a high degree the power of adaptation. Their juices are poured out in correspondence, both qualitatively and quantitatively, to the amount and kind of food partaken of. Moreover, they secrete precisely that quality of fluid which is most serviceable for the digestion of the particular meal. This was shown by the late Professor Carl Ludvig, of Leipzig, to be accomplished by the innervation of the glands.

The saliva is the first fluid which everything encounters on entering the alimentary canal. Dr. Glinski tells us that it plays the part of host to every substance taken in. It moistens the dry, dissolves the soluble, envelops with mucus the bulky and hard, so as to facilitate its passage down the narrow œsophagus, and finally submits certain food materials to a process of chemical elaboration. The saliva is secreted in the first compartment of the alimentary canal, which is at the same time the sorting room of the organism. Much of what enters the mouth may prove to be useless, or even noxious, and must have its deleterious properties neutralised or be completely rejected; thus the saliva is secreted to counteract injurious effects. Strong acids are to a certain degree neutralised, while other corroding substances may be simply diluted, and by mere lessening of concentration have their harmful effects diminished.

Rogers[6], in his text-book of "Comparative Physiology," points out that the constant need of every animal body for water is almost self-evident. Water, in addition to being the vehicle by which all primary foodstuffs are brought to the cells of the animal body, is also the vehicle by which all cell wastes are removed from the cells. It is the agency by which diffusions through the cell membranes take place. No substance can enter the cells or leave them except in the form of

dilute aqueous solutions. Bone, for instance, contains 40 per cent. of water, blood 90 per cent., liver cells 75 per cent., the nervous tissue 85 per cent., muscle 75 per cent., and the average secretion of the saliva gastric and intestinal secretions, 95 per cent.

Pavlov,[4] after telling us that water acts as an excitant to the flow of gastric juice, goes on to say that " water is very widely distributed in nature, and the instinct for it—thirst—is even more pressing than the desire for solid food. If a dry meal is eaten without appetite, thirst will compel an animal to drink water afterwards, and this fluid suffices to ensure the beginning and continuation of the secretory work of the glands." . . . " Presentation of dry meat powder or dry bread, for which a dog has no particular inclination, produces a copious flow of saliva ; moist flesh, for which it actively strives, produces little or none." . . . " Much more saliva is poured out for milk than for flesh, when mucous saliva is mixed with milk ; a looser and more easily digested coagulum is afterwards obtained when it meets with the gastric juice." . . . " Milk saliva is very concentrated, the richest of all in organic solids, and its volume is large."

Certain drugs such as atropin inhibit the secretion of glands. Bicarbonate of soda presents the stimulating properties of water.

We find that when fluid egg-white is introduced into the stomach of the dog, either pure or diluted with an equal quantity of water, we obtain no greater secretion of juice than a similar quantity of water causes, yet this introduces a protein food into the stomach. Professor Rinzantsav showed that the introduction of egg-white into the alimentary canal is able to influence the output of nitrogen in the urine without exciting digestive action. Thus here is also a protein that is not acted on by the gastric juices. Lohasor also showed that the protein substance fluid egg-white showed no stimulating effect on the gastric juices. Sokolov showed that the secretion of hydrochloric acid prevents the further secretion of gastric juice when it has accumulated in any considerable quantity ; other acids do not exert this inhibitory action.

The mere moistening with water secures a certain amount of gastric juice, and Sokolov has further shown that saliva is more effective than an equal quantity of water. In several experiments quantities of saliva varying from 100 to 200 c.c. were introduced into the stomach of a dog with the constant result that considerably more gastric juice was secreted than followed the injection of a like volume of water. (Lectures by I. P. Pavlov.)

This, although interesting, bears rather on the feeding of dogs when ill than in health, but it all emphasises the fact that water is the first essential to the dog and takes priority to solid food. Obviously it should be presented pure and clean, and it is seldom a dog will drink with avidity polluted water unless pressed by extreme thirst or in disease.

It is an interesting fact that the ash of sucking young, in every species of animal is identical with the ash of its mother's milk. The quicker the growth of an animal the more concentrated is its mother's milk. For instance, a dog will double its

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weight in eight days. Protein in bitches' milk is 7.1 per cent. A foal doubles its weight in sixty days, protein in mares' milk is 2 per cent. In a puppy the brain equals 1/30th of its bodyweight ; lecithin in bitches' milk is 2.1 per cent. A calf's brain weighs 1/370th of its bodyweight ; lecithin in cows' milk is only 1.4 per cent.

The ash in a substituted milk cannot therefore compete with the mother's as the ash cannot be suitable unless it were varied to such an extent as to make it commercially impossible. May Mellanby impresses on us that a deficiency in the mother's diet during pregnancy may influence the offspring throughout its life. She tells us that proper maternal feeding on the lines she indicates is of great importance in the production of good health in the developing offspring. Poorly calcified deciduous teeth can be produced in the offspring by the feeding of the mother on a diet deficient in vitamin D, but that the permanent teeth suffer more if the pup itself is fed on a deficient diet.

Edward Mellanby (Special Report, series No. 61, " Experimental Rickets ") says : " One point which has come most prominently before my mind as the work [' Experimental Rickets '] has progressed, is the unity of a complete diet and the interdependence of the dietetic elements. Knowledge has been accumulating in recent years which emphasises the importance of balanced diets, and we know that to cut out one element of the diet means not only the absence of that element, but also the ineffective action of other elements. For instance, when carbohydrates are removed from the diet, fat is ineffectively oxidised, and there is also good evidence that in their absence both animals and plants are incapable of synthesising proteins from the amino acids. This is a simple instance of the absence of one element upsetting the action of other elements. When protein is cut out of the diet, although the immediate effects of its absence are not properly understood, yet both man and animals are incapable of eating the diet for more than a few days." (The whole of Mellanby's work was done on the feeding of dogs.)

Going to the other extreme, Whitney, in the *American Kennel Gazette* of May, 1932, tries to argue that the best food for his breeding bloodhounds was a dietary which one would hesitate to feed to store pigs, and although he shows a lamentable ignorance of the physiology of the dog's digestion, he hits on a dietary which, after all, contains in a crude form the essentials of a complete diet. He writes on the inability of the dog's saliva to reduce starches into sugars, not mentioning the other enzymes in his digestive juices. Another physiologist tells us that the dog is an efficient converter of starch, raw or cooked, even laundry starch. Saliva contains a little and pancreatic juice a considerable starch-splitting power ; potato, even in reasonable amounts, is efficiently handled.

We know that carbohydrates and fats are food substances containing no nitrogen, and are useless for the building of proteins, but have high fuel value and produce heat and energy. When carbohydrates or fats are taken as foods they are used to conserve the body proteins which might otherwise be used in

furnishing the energy needed for various metabolic activities. Any excess of carbohydrates or fat above the amount needed to supply the energy for muscular work may be stored within the body.

Again, Rogers[6] tells us that carbohydrates such as sugars and starch (which latter is eventually transformed into sugar) have great energy value, but do not provide for the re-building of animal tissue. It amounts to this, that the development of muscular activity is dependent in the dog, or other animals, on the ability to metabolise sugar. Animals fed on a wholly protein or protein and fat diet may continue to do muscular work. This does not mean that the protein or fat is being directly utilised by the muscles, but involves the transformation of some part of the protein or fat into carbohydrate, which is then used by the muscle.

Sugar does not supply the nitrogen needed for tissue building, but it does, on account of the ease with which it is oxidised, play an important part in animal economy. It supplies the energy needed for muscular work. It supplies the heat needed for maintaining the body temperature, and it thus saves the body protein as a source of energy; also, if there is an excess, it is stored as glycogen, or may be synthesised into fat. This all shows how essential a certain amount of carbohydrate is to the dog's diet. This is usually supplied either in the form of bread, rusks or biscuit. In the baking of break the starch granules are not broken up, whereas in biscuit much of the starch is already broken up into dextrose.

E. Mellanby in all his experiments in feeding dogs with a view of experimental rickets appears to have fed bread. He found that carbohydrate minus protein produced rickets. Meat tends to diminish or prevent rickets, bread encourages it. Bread, like meat, is deficient in both fat soluble vitamin A and calcium salts, but as regards rickets the action of bread is opposite in nature to that of meat, but he found that the greater the amount of bread eaten the greater the increase of weight and formation of new tissues. He found that very bad defects in calcification of bone can be produced when rapidly-growing puppies eat fair quantities of meat if the diets are otherwise unbalanced, and especially when an excess of bread is eaten.

M. Mellanby found that there was evidence to suggest that there is a chemical entity of unknown composition in cereals, and especially in oatmeal and wheat germ, which actively interferes with the normal development of teeth. She found that without vitamin D perfect calcification will not take place, however much calcium and phosphorus is given in the diet.

Whilst discussing rickets, which is such an important matter with many in the rearing of puppies, I would mention that Findlay believed that rickets was a disease due to confinement and lack of exercise. E. Mellanby, however, showed that although it was evident that exercise might be a factor of importance, yet it could not be the primary factor responsible for the disease. He showed that puppies could be confined under very close conditions, and yet if well fed

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during this period the disease did not develop. He points out that the greater the growth of a pup, the worse is the condition of rickets produced, and he found that excess of bread might be responsible for the exaggeration of the rachitic syndrome.

H. Lossl[11] states that puppies of large breeds show twice as efficient food utilisation as those of small breeds. He found that rice and other concentrates (*sic*) were not advantageous. He had the best gain on fresh meat, but quite good results from dog biscuit made from rye meal.

Jordanoff[12] advises a mixed diet for dogs on a raw meat basis, fish without bones, and for young dogs the addition of cod-liver oil, "Vigantol" (which I do not know) and a vitamin calcium preparation. Legumes, he tells us, are not digested, and dog biscuits are a worthless and expensive food. As, however, I doubt the first assertion, I see no reason even to believe the second.

Paton,[13] in an examination of many commercial dog foods in America, draws the following conclusions: (1) Many lack vitamins, although the latter are said to be present; (2) there is little evidence that the foods are balanced; (3) too much reliance is placed on the chemical analysis and not enough on biological analysis; (4) many foods are just sufficient for a maintenance diet, but quite deficient for growth and the reproductive cycles. The meat put in some of the American foods is more suitable for fertilisers.

H. W. Watson[14] (*Nature*, August 12th, 1933) states that evidence has been collected (I should like to know where, and by whom) that canine hysteria is due to vitamin A deficiency, associated with the ingestion of a substance present in dog biscuit and other cereals. He experimented with fifty-four hysterical dogs. All had a preponderance of cereals in the diet: Twenty-six were given the same diet and remained hysterical; twenty-eight were changed to a diet with more vitamin A, and recovered. I do not know what biscuit was given, or its composition, which makes all the difference; but E. Mellanby produced symptoms resembling canine hysteria by adding wheat germ to a diet containing a deficiency of vitamin A. I hope that another year one of the papers will be on this disease, when we can better discuss it. I wish, however, to point out the fatality of classing dog biscuits as all alike. They are, on the whole, undoubtedly the best and most convenient form of adding carbohydrates to the dog's diet, but they differ vastly in their composition. The diastatic activity of the intestinal juice of dogs varies with the carbohydrate content of the diet. It increases on a diet of bread or biscuit, and decreases on its withdrawal, and is at a minimum on a meat diet. The dog by nature is a carnivorous animal, as assured amongst other things by the formation of the teeth, and meat is still the best and most convenient form in which protein can be introduced into his dietary, although Kinarov tells us that beef muscle and haddock flesh produced equal quantities of digestive juices and digestive powers, and argues that fish is as good as beef for food. Karl Thomas found that animal proteins contain more nutritive value than plant proteins.

He worked out their biological values by experiments thus: Ox meat, 104; cow's milk, 100; fish, 95; rice, 88; potatoes, 79; spinach, 64; peas, 56; wheat flour, 40; corn meal, 30.

In some cases the digestion of certain proteins in the diet is conditioned by the presence of other proteins. Mitchell informs us that beef contains 20 per cent. protein, of which 95 per cent., or 19 per cent. of the total, is digestible. Protein is the only means by which an animal can introduce nitrogen into the body, and the presence of nitrogen is essential to the building up and repair of tissue. Rogers tells us that nitrogen storage in the body does not take place except as new body protein. The nitrogen equilibrium shows that the animal body tends to excrete as much nitrogen in urine, perspiration, etc., as it takes in food. Protiens are exceedingly complex substances and are built up of various amino acids combined together in various ways. Under the influence of pepsin in an acid medium they are changed into peptones. The work of protein digestion is incomplete in the stomach of all higher animals, and is handed over to the intestines for the further action of trypsin and erepsin. Trypsin is an enzyme which acts in an alkaline medium on all forms of protein which have been received into the intestine, and reduces them to simpler forms. There is a continuous absorption of amino acids wherever these come in contact with the absorbing surface and villi of the intestine. The villi of the intestine are only in movement in loops of the intestine in which intestinal contents are present. Whilst trypsin works on proteins, erepsin works on the simpler substances such as proteoses, peptones and peptides, these it splits up into amino acids. Some proteins contain amino acids which the animal does not need for building its own proteins. Other protein foods lack amino acids which the animal must have. These facts make it clear that not all proteins have the same biological value, and to my mind this explains why puppies grow and thrive better on one sort of flesh than another. Amino acids not used to build proteins can, Rogers tells us, be used for energy; first-however, they must be transformed into carbohydrates.

According to Rubnor, the intake of protein food serves as a distinct stimulus to increase the general metabolism of the body. In certain cases a larger diet of meat may cause an increase in the total metabolic rate of as much as 90 per cent. The effect of carbohydrate food is much less, amounting to only 30 or 40 per cent.

It is therefore perfectly clear from a biological and a practical point of view that certain forms of food are essential for the building up and maintaining the body and health of the dog: water, carbohydrates, proteins and fats, together with a certain quantity of those food accessories known as vitamins. E. and M. Mellanby stress the importance of vitamins A and D. M. Mellanby points out that proteins, carbohydrates and most vegetable fats have no calcifying powers and that vitamin D found in natural foods exists only in egg yolk, milk, suet and cod liver oil, or can be artificially produced in foods by irradiation of their ergosterol content or even by irradiation of the animal's skin by ultra-violet rays.

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Many foods contain the pro-vitamin ergosterol, which becomes activated to vitamin by irradiation.

In view of our present knowledge, both biologically and chemically, practical and theoretical, certain facts appear to me to stand out. Firstly, the dam must be prepared at or before conception if the pups are to be healthy and strong. Whatever the breed she should have meat, carbohydrate, and added vitamin A and D, and these essentials should be continued throughout lactation, and continued to the pups from the time of weaning until the teeth are changed. The vitamin content of food after this period is not of such urgency. In the usual food of dogs there is no source of vitamin A except in the mother's milk and liver, should it be fed. In meat there are large supplies of both forms of vitamin B and E ; dogs require little or no vitamin C, whilst vitamin D, which is so essential to puppies, occurs in none of the natural foodstuffs for the dog. Therefore sunlight appears to be the only natural source of vitamin D through irradiation of ergosterol.

M. Mellanby states that puppies fed on a diet rich in calcium, phosphorus and plenty of vitamin A, were given irradiated ergosterol up to 1,000 times the minimum effective dose. A complete analysis of blood calcium and phosphorus metabolism and X-ray examination showed no deleterious effect and the teeth were normal. The conclusions are that vitamin D in these concentrations is not deleterious to young growing dogs on an otherwise complete diet. Providing the digestion is not upset, there is no risk in overdoing it. For working dogs it is well to consider the findings of Mangold, who proved that exercise delays the emptying of the stomach and excretions. Dogs should therefore be fed, not before, but after work.

It is obviously impossible and impracticable to lay down hard-and-fast rules concerning the diet of a dog when one has to consider not only the work done and required of the animal, but the vast differences in breeds, sizes and shapes. The digestive tract and secretions are the same in the species whatever the breed; and whatever the breed, sound teeth, bone and constitutions are essential; therefore prepare your bitch before conception by feeding an adequate sufficiency of carbohydrates, proteins and vitamins for her to produce healthy young, and continue to feed these essentials, at all events, until the call for fresh cell tissue has ceased, which means at death.

The dog's condition must be studied, and in this respect there is variation in individuals as well as in breeds. Too much adipose tissue leads to derangement of the heart, liver and other organs, and should be reduced or kept in check by work or regulation of diet. Excess of fat or carbohydrate taken into the body is, Rogers reminds us, stored as fat in adipose cells. If there is lack of sugar or sugar-forming substances in the body to furnish energy for muscular work or maintaining temperature, these fat supplies of the body are called upon. The fat is oxidised as would be sugar, into carbon dioxide and water. Fat yields nine calories of heat per gram, sugar only four.

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I desire to express my grateful thanks to Mr. E. G. White, M.R.C.V.S., and to Major T. Dalling for the assistance they have given me in revising this paper and in connection with the references.

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SPLENIC EXTRACT IN THE TREATMENT OF NON-ULCERATIVE PARENCHYMATOUS (INTERSTITIAL) KERATITIS.

By GEORGE DYKES, M.R.C.V.S.

Glasgow.

As a sufficient number of subjects may not be forthcoming to furnish a more comprehensive report upon the efficiency of splenic, protein-splitting enzyme as a therapeutic agent for the acceleration or inducing, in the instance of stasis, resorption of the opacity which is a clinical feature of the above condition, this preliminary report upon three subjects is submitted so that any colleague who may be interested in ophthalmology may be encouraged to investigate further and report upon a therapeutic measure which promises to be deserving of our closest attention.

In the literature concerning the ætiology, pathology and fate of the corneal infiltration, no reference has been found on the biochemistry of the nebula itself. But from a similarly wide review a not irrational assumption is made: that the lesion is essentially a protein coagulum, formed from the excessive amount of fluid which permeates the tissues, together with the wander cells which infiltrate the substance of the cornea. This is a phenomenon which characterises the commencement of every inflammation of the cornea, leaving a lustreless opaque cornea which, with varying density, may partially or *in toto* obscure the iris, and

which may in time become boldly or very discreetly vascularised by either superficial blood vessels arising from the marginal loupe of the limbus, or by deeply situated branches derived from the blood vessels of the sclera, or by both. Again, as is less frequent, the cornea may remain avascular. The result is an appearance which we clinically designate parenchymatous (interstitial) non-ulcerative keratitis.

That resorption, irrespective of the presence or absence of vascularisation, does take place in most cases is a well-known though protracted termination. The transparency of the cornea is apparently restored, though in reality a degree of opacity which may be ascribed to the damage done to the corneal substance itself remains. The blood vessels which were engaged in the process of repair remain for life.

A study of the mode of repair in untreated cases lent weight to the view that in the main, the opacity is essentially protein in nature, also that the inevitable cicatricial tissue in this form of keratitis is relatively negligible. Accordingly it was thought that by introducing the protein-splitting enzyme into the circulation, solution of the assumed coagulum would be achieved. In the limited clinical investigation this hope appears to be more than justified.

Subject No. 1.—Canine, cross, male, *æt.* one year seven months; 15 lb. Bilateral complete opacity of the cornea of both eyes; no superficial blood vessels, density too great to discern presence or absence of deep vessels, irises obscured.

History.—That this opacity, which had accompanied canine distemper in the subject, had persisted for six months without showing any reduction in either extent or density. 0.5 c.c. protein-free splenic extract given intravenously. At five minutes the subject showed a profuse lachrymation, the cornea appeared to be "steaming"; this, I am told, persisted for six hours. Seven injections at weekly intervals restored transparency, when a well-marked "broom-like" deep vascularisation was revealed.

No. 2.—Wire-hair Fox Terrier, male, *æt.* two years. Unilateral complete opacity of cornea which barely obscured the iris. Transillumination showed a well-marked deep vascularisation. The condition, which had persisted for approximately four months, was probably due to an iritis. The post-injection phenomenon was delayed for several hours, and appeared to be less marked than in subject No. 1. Nor was it noted on subsequent occasions. Under four weekly injections resorption was making steady progress till, unfortunately, this subject was killed in a street accident; more unfortunately still, I was not able to secure the eyes of the subject.

No. 3.—Shetland Collie, female, *æt.* (?) three years.

History.—Incomplete; the subject was possessed of a central nebula at time of taking possession, two months prior to date of examination. Both eyes showed a central and spreading cataract in addition to the above nebula on right. Non-vascularised; diabetes M. eliminated; cause doubtful. In respect of opacity of cornea, this subject was treated comparatively with more commonly known methods, *e.g.*, calomel flicked on the cornea, with and without massage, followed

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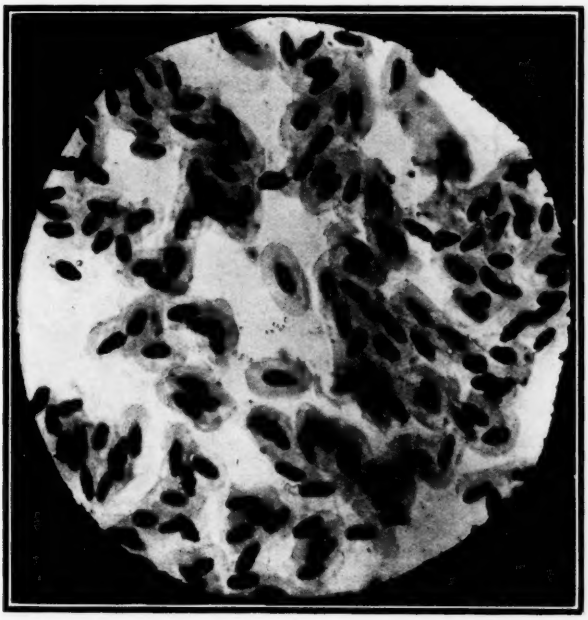

Goose Cholera.

(*Article by* G. Mayall, M.R.C.V.S., *page* 389)

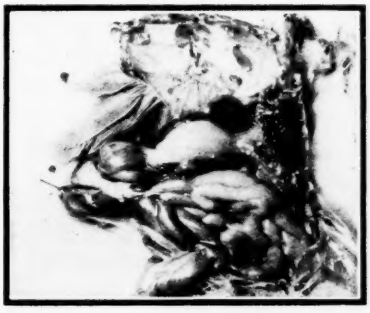

FIG. 1.

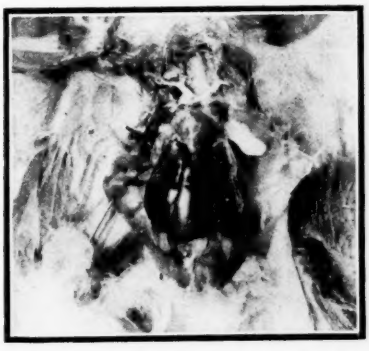

FIG. 2.

(*Article by* A. Z. Baker, B.Sc., M.R.C.S., L.R.C.P., J. Courtenay-Dunn, B.Sc., and M. D. Wright, B.A., M.B., B.S., *page* 385)

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by a period of seven days' rest; occulentum hydrargirum oxidium flav. cum dionin; rest. Subconjunctival injections, two. In all, these were without result. Eight bi-weekly injections of splenic extract were given. An appreciable decrease in density, not only of the nebula of the cornea, but also of the cataract, resulted. The remaining opacity I believe to be due to cicatricial tissue. This subject showed noteworthy physical reactions following the injections, *viz.*, despite a maintained appetite, emaciation attended the period of treatment by splenic extract. A marked dullness, which persisted for twenty-four hours, was noted to follow the fourth and fifth injections.

I offer my apologies for what is to me a premature report upon a most incomplete observation; my sole object in so doing is that others may investigate this method of treating a condition which proves so refractory to other known methods—the persistent opacity of non-ulcerative parenchymatous keratitis.

OBSERVATIONS ON FUNGAL PNEUMONIA IN THE DOMESTIC FOWL.

By A. Z. BAKER, B.Sc., M.R.C.S., L.R.C.P., J. COURTENAY-DUNN, B.Sc., and M. D. WRIGHT, B.A., M.B., B.S.

At the Research Laboratory, Vitamins, Ltd.

In a series of post-mortem examinations on fowls of all ages, we have been impressed by the frequency of disease due to fungal infection, especially in the lungs. The following observations are based on rather over 100 outbreaks of pneumonia in various parts of England and Wales, and have led us to the conclusion that fungi as pathogenic agents are more active than is generally believed, and are at present a cause of much preventable loss to the poultry industry. The fungal pneumonias have a somewhat characteristic age-incidence, naked-eye appearance and history. In this series 34 per cent. were of fungal origin. Under two weeks old, 24; two to twelve weeks, 6; twelve to maturity, 3; older birds, 5.

The characteristic history is that chicks appear perfectly healthy for three, five or even seven days. After this deaths occur, a few each day, some three or four in units of 100. In some cases a unit of 100 chicks may be completely lost in two or three weeks. Many owners notice no symptoms. Some of the more observant record that the birds have appeared cold, no matter what the temperature; diarrhœa is sometimes noticed and B.W.D. suspected. In eight such cases in young chicks bacterial cultures were taken with negative results. The mortality varies considerably, but the following are recorded: 12 per cent., 13 per cent., 20 per cent., 28 per cent., 50 per cent., 70 per cent., 75 per cent.

Post-mortem Appearances.—There are several distinct pictures, with intermediate forms between each. A diffuse form appears as one or more slightly raised solid patches of irregular shape and outline visible on the surface of the lung, and giving the impression of radiating out from one or more centres. These

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patches may be of any size, from that of a millet seed up to quarter or more of the external aspect of the lung. Such a patch may be salmon pink, paler and duller than the healthy lung ; it may be creamy, greyish or even green, and often appears as an opaque area in a more transparent greyish gelatinous-looking matrix. Occasionally lungs are seen containing much of this gelatinous matter with a few small patches of the type already described and a sprinkling of yellow pin-point spots. Another characteristic finding is that the lungs may be riddled with minute yellow bodies, circular in outline and varying in size from those just visible to the naked eye to others about one-twelfth of an inch in diameter. There may be nodules of all sizes in the same lung. The whole organ appears dark purple and congested. Where such nodules are present in vast numbers they are frequently found to have spread outside the lung, and small aggregations are to be seen in the intercostal muscles attached to the ribs or to the pericardium and in the areolar tissue on the surface of the gizzard and proventriculus. Descriptions of similar white nodules are frequent in literature.[1] Fig. 1 indicates the wide distribution of such lesions in a fourteen-day-old chick. It is unusual to see in the bird the typical fungal growth as it appears on a culture medium or on its vegetable host, but such colonies have been observed. In Fig. 2, a growth of aspergillus is seen on the lower surface of the lung ; other chicks from the same unit showed the nodular type of pneumonia.

Where the infection has been too slight to produce death in early life and the bird reaches maturity, the appearances are those of a chronic fibroid pneumonia usually involving the greater part of both lungs. Extension of the parasite into neighbouring organs occurs by direct spread. In chicks the liver may be seen under a hand lens to be studded with minute grey gelatinous areas, and occasionally may contain a few tiny yellow bodies. The latter have also been seen in and on the spleen.

Fresh Preparations.—Small shreds of the diseased portion of the lung are teased finely with needles and mounted in a special medium consisting of: carbolic acid, 20 c.c. ; lactic acid, 20 c.c. ; glycerine, 40 c.c. ; water, 20 c.c. Examination under 2/3 and 1/6 objectives occasionally makes it possible to define fungal hyphæ, and to distinguish branching or septation. Rarely fructification can be seen. By ringing the coverglass with cement, such a fresh preparation can be preserved for photomicrography and Figs. 3 and 5 show the results obtained by this method.

Culture.—Rather large portions of lung removed with sterile precautions are planted on one or other of suitable media. Most of our work has been done with beerwort agar, but Sabouraud's glucose and maltose agars have also been used. In most cases good growth occurs at room temperature on beerwort agar. Mycelium can usually be seen in from seven to fourteen days. Earlier in the investigations we anticipated growing aspergillus, but in addition we have grown pure cultures of many other fungi. In the outbreaks under consideration aspergilli have been grown in eighteen cases, and in the remainder no aspergillus has appeared,

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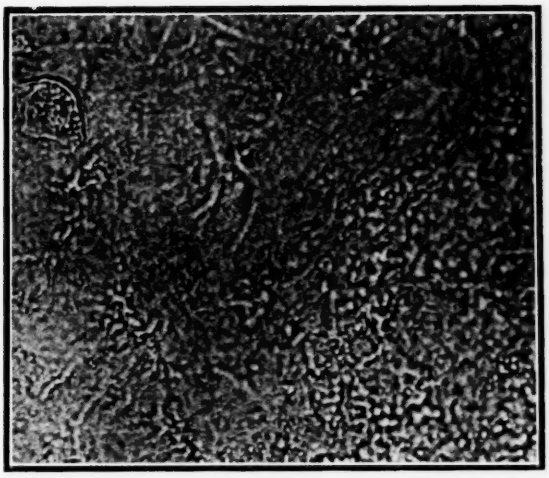

FIG. 3.

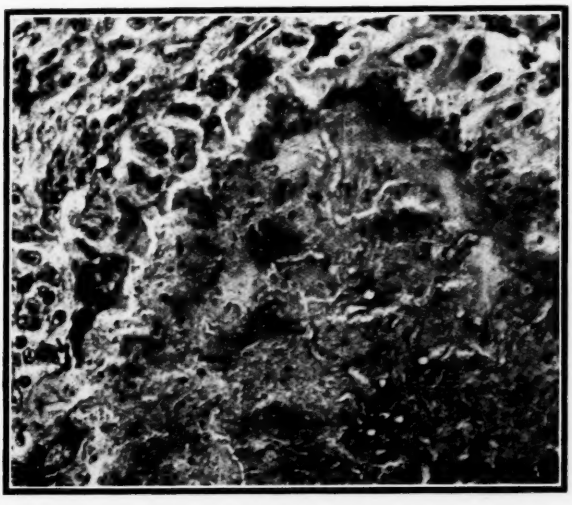

FIG. 4.

Article by A. Z. Baker, B.Sc., M.R.C.S., L.R.C.P., J. Courtenay-Dunn, B.Sc., and M. D. Wright, B.A., M.B., B.S., *page* 385)

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but instead one or other of the following: *Mucor racemosus, Mucor corymbyfer, Saccharomyces* sp., *Penicillium* sp., *Cladosporium, Diplodia* sp., and others which we have been unable to identify.

Microscopic Appearances.—The lung is usually changed in such a way that little normal tissue remains. The blood vessels are engorged and the complete disappearance of many air spaces is noticeable. Many of the alveoli are filled up by inflammatory tissue, and there may be multiple areas of necrosis. The alveolar endothelial cells increase in size, and there are many small mononuclear cells surrounding them. Mycelial threads may be distinguished ramifying through this inflammatory tissue as in Fig. 6. The necrotic mass, corresponding to the small white nodule usually shows hyphæ spreading centrifugally in an eosinophilic, homogeneous mass in which a few basophil granules are the only recognisable nuclear remains. The periphery of the necrotic mass may be studded with giant cells (Fig. 4) containing some five to fifteen nuclei. Giant cells may also be found scattered in small aggregations in inflammatory tissue. The peripheral layer is a band of small cells of the lymphocyte type.

At times one may see a bronchiole containing exudate on the surface of which there is a thick mat of mycelial threads as in Fig. 7, and very long hyphæ are occasionally seen in blood vessels of the lungs (Fig. 8). Similar inflammatory tissue occurs in the spleen. In the liver small white nodules have been found containing fungal threads centrally, together with disappearance of large numbers of the hepatic glandular cells, which remain as isolated islands.

Experimental Transmission.—Since we had recovered from pneumonic lungs fungi which we were not accustomed to regard as common pathogenic agents, we selected one of these (Fig. 9) for use in an inoculation experiment to determine whether it were possible to reproduce the disease. A few cases of pneumonia due to *Penicillium* sp., to *Monilia* sp., and to members of the Mucorales, have been recorded by other observers.[2]

Sixteen three-week-old cockerels of the same stock, crossbred R.I.R. by L.S., were used, housed in two units of eight in wire-floored metal cages under exactly similar conditions in a small intensive house. The inoculant was prepared by washing spores off a three-weeks-old culture slope of the *Diplodia* sp., with 10 c.c. of sterile saline shortly before use. One minim of this was injected intratracheally into each of eight birds, the others being kept as controls. Each bird's mouth was held well open and the larynx clearly seen. The needle was introduced and the inoculation made by sight into the trachea. The procedure presented no difficulty, and required only a few seconds for each bird. When the bird was put down after the inoculation it showed a dramatic and sudden appearance, possibly due to shock. The head drooped, all power in the limbs seemed to disappear, the eyes closed and the bird rolled over. This condition persisted for about five minutes and gradually passed off without interference, all the birds being normal and feeding again within an hour. They were kept for two months.

From the date of inoculation the birds appeared quite normal for five to six

weeks, and grew as well as the normal birds. During the last fortnight of the experiment (from six to eight weeks after inoculation) their appearance became unsatisfactory, some anæmia was evident, the plumage became loose and straggly, and a few began to gasp. Latterly two went off their feet.

Post-mortem Appearances.—At eleven weeks old they were all killed and examined. The control birds had perfectly healthy lungs. Those injected showed turgid, purplish-blue lungs, oozing blood-stained fluid on section. The consistency was firmer than that of the normal lung, but no white patches were found. A pinkish-salmon patch was seen in one lung. The cervical glands appeared congested and larger than usual. The livers were pale and had undergone fatty change.

Fig. 10 shows the condition in comparison with that of lungs removed from a control bird. Cultures made from the lungs of the inoculated birds grew in four of the eight cases the same fungus as had been injected. The other four culture tubes remained free from growth, and possibly insufficiently large pieces of tissue had been used. So far it has not been possible to identify the fungus in sections of these lungs, but it is well recognised to be by no means easy to demonstrate the presence of mycelium in a tissue from which it is readily recovered culturally. It would appear that under certain conditions hyphæ can readily take up the histological stains, whereas in other cases great difficulty is experienced, and while some specimens yield clear preparations, in other cases the naked-eye appearances and cultural recoveries are the only demonstrable features. These difficulties of technique are well recognised by mycologists.

Discussion.—The first point to be emphasised is the unexpected frequency of these types of pneumonia in young chicks and older birds. The infection is evidently air-borne, as the lungs are usually the most extensively infected organs, and where lesions have been found in other situations, such as the liver, there is usually extensive disease in the lungs also. Bridge and Claypole describe[4] the histological picture of the method of invasion in a case of human actinomycosis, and it is probable that a similar invasion by inhalation of spores occurs in birds. Since death frequently occurs at seven to ten days old, with extensive lung invasion, the infection must take place very early in life.

Most of the invaders found are characteristic flora of damp wood, chaff, hay, bran and other cereal products. The spores of *Penicillium*, *Mucor*, *Aspergillus*, *Cladosporium* and *Diplodia*, and of many other types, are abundant in cereals[5] and can be expected to multiply when such materials are stored warm or damp. These invaders appear to have acquired the power of growing rapidly on tissues and at a temperature both different from those one is accustomed to regard as normal for them. A dusty atmosphere favours the development of this disease in chicks, and one recalls in this connection the records of French hair-sorters, who used rye flour in sorting, and therefore worked in an atmosphere thick with rye dust. In these rooms, birds died after a fortnight's exposure.[6] The majority, though not all, of our cases have come from hover-reared birds, where possibly

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FIG. 5.

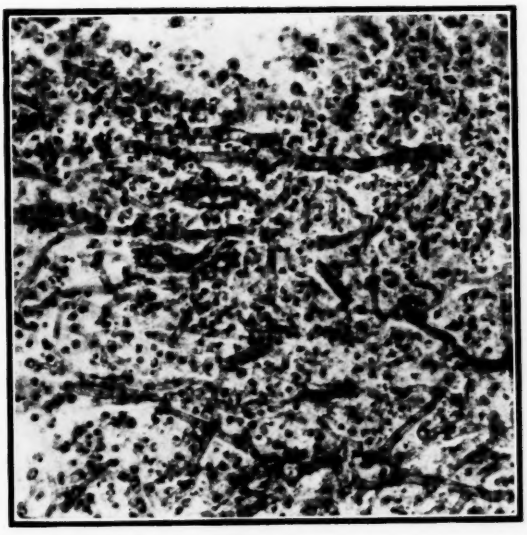

FIG. 6.

(*Article by* A. Z. Baker, B.Sc., M.R.C.S., L.R.C.P., J. Courtenay-Dunn, B.Sc., and M. D. Wright, B.A., M.B., B.S., *page* 385)

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FIG. 7.

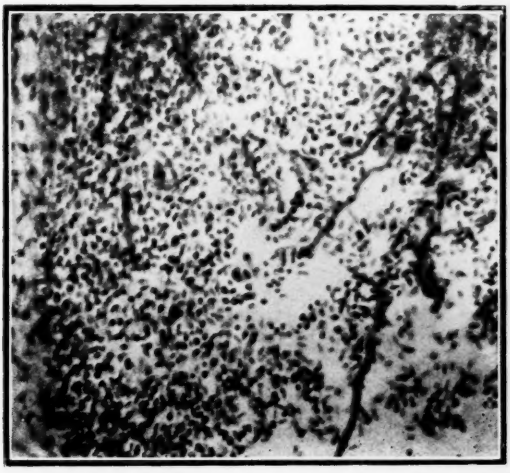

FIG. 8.

FIG. 9.

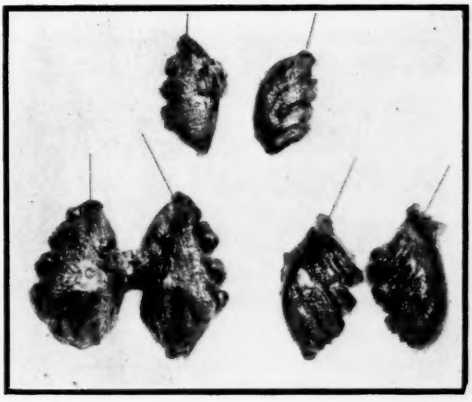

FIG. 10.

(*Article by* A. Z. Baker, B.Sc., M.R.C.S., L.R.C.P., J. Courtenay-Dunn, B.Sc., and M. D. Wright, B.A., M.B., B.S., *page* 385)

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the scratching in litter heavily charged with such spores has produced sufficient dust for infection to occur. In several outbreaks it has been possible to protect later batches of chicks from the disease by destroying infected litter and by alterations in rearing methods, including the introduction of wire floors.

As the disease does not admit of any cure when once established, these preventive methods are the only applicable ones. Methods of storage of all cereal products intended for use, and also of litter in dry, cold places, thus become important, as exposure of such products to warmth and damp facilitates the increase of fungal invasion in their substance, and renders them unsuitable for use in poultry rearing. Dry storage of chaff, wood-chips and such similar matter as may be used for litter is also shown to be important, as the farmer may lose, by using unsuitable materials, considerable numbers of birds.

The disease formerly regarded as aspergillosis appears to be capable of production by other varieties of fungi, whose growth on damp material is often inconspicuous and likely to pass unnoticed; it is not enough to conclude, therefore, that the absence of green mould is a criterion of safety. In view of the practical applications involved the further study of the pathogenicity of fungi is desirable.

We are indebted to Vitamins, Ltd., for the facilities given for this work in the pathological section of their Research Department, and to Agricultural Food Products, Ltd., for the pathological material used; also to Dr. Ramsbottom, Keeper of Botany, the British Museum, for help in the identification of fungal specimens.

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GOOSE CHOLERA.

By G. MAYALL, M.R.C.V.S.

Bolton.

On December 1st, 1933, a dead goose was sent to me for post-mortem. The owner stated he had lost ten geese in quick time. On post-mortem, the mouth was full of sticky mucus, the brain congested, the liver had hæmorrhagic spots and the pericardium petechiæ. Smears from the heart blood stained with methylene blue showed many of the characteristic bi-polar organisms (*see* illustration).

The owner was recommended to go in for thorough disinfection: ground to be turned over and limed, goose house to be scraped over, and then scorched with a painter's blow lamp, after being washed down with a 10 per cent. solution of caustic soda. Dead birds to be burnt and fresh purchases isolated on fresh ground.

THE COMMON BRACHIOCEPHALIC TRUNK
(*Truncus brachiocephalicus communis*)
AND ITS RAMIFICATION IN HORSES.

By Dr. Med. Vet. ELMAR VAU.

Assistant to the Professor of Anatomy at the Veterinary Anatomical Institute of the University of Tartu (Esthonia).

In the veterinary anatomical text-books composed by older authors we find positive and definite statements concerning the structure and arrangement of organs. Later authors have completed these statements, showing that the hitherto existing knowledge in the sphere of anatomy was not complete. Anatomical dissections constantly reveal cases in which the structure and arrangement of the blood vessels vary, and do not correspond to that described in the text-books. Such variations frequently occur in the ascending aorta (aorta ascendens) in horses.

According to Ellenberger-Baum[1] the brachiocephalic trunk, which is 6–8 cm. long, arises within the pericardium from the convexity of the aortic arch. At the level of the 2nd–3rd thoracic vertebræ it divides into the smaller left brachial artery (art. subclavia sinistra) and the larger brachiocephalic artery (art. brachiocephalica). In exceptional cases they both arise separately from the aortic arch. The brachiocephalic artery passes along the right side, where it gives off: (1) the dorsal or costo-cervical artery (art. costocervicalis); (2) the deep or superior cervical artery (art. cervicalis profunda); (3) the vertebral artery (art. vertebralis), as well as the bicarotic trunk (truncus bicaroticus). The remaining trunk is called the right brachial artery (art. subclavis dextra). The costo-cervical artery frequently (especially on the right side) has a common trunk with the deep cervical artery, but occasionally it may also arise from the brachiocephalic trunk. The deep cervical artery can also arise by a common trunk with the vertebral artery (art. vertebralis). We find the same points noted in the text-books that are in common use here, *viz.*, Martin,[3] Schmaltz,[4] Chauveau-Arloing,[2] Zimmerl,[5] and Sisson.[6]

The following questions remain unsolved in the above-given description of the brachiocephalic trunk and its ramifications in horses: (1) How often the left brachial artery arises from the aortic arch or from the brachiocephalic trunk, *viz.*, the proportion? (2) The exact place from where arise the left brachial artery, the deep cervical artery, and the vertebral artery, as well as which of the rami-

fications should be considered predominant? (3) What peculiarities in the general aspect of the ascending aorta are conditioned by such varying origin of the arteries?

Personal Investigations.

In order to clear up these questions the ramifications of the ascending aorta have been examined in thirty-six horses which were killed and injected with formalin and gypsum for dissections. The horses were of both sexes, and of mixed breed. The investigations have shown, as it may be seen from the adjoined table, that the origin of the left brachial artery is not constant. In thirty-three cases it arises from the brachiocephalic trunk, whereas in three cases it begins in the aortic arch parallel to the brachiocephalic artery. Consequently our investigation shows that the left brachial artery arises in 8.3 per cent. of horses from the aortic arch and in 91.7 per cent. from the brachiocephalic artery. The beginning of the left brachial artery from the brachiocephalic trunk varies considerably, for it may arise either from its proximal or from its most distant part, the distance usually varying between 1 and 9 cm. The whole length of the brachiocephalic trunk also varies accordingly between 0 and 9 cm. (*see* Table I). Being conditioned by the length of the brachiocephalic trunk, the length of the brachiocephalic artery is also not constant, and varies from 3 to 10 cm., the average being 5.37 cm. The longer the brachiocephalic trunk is the shorter will be the brachiocephalic artery, and *vice versa*. The longest brachiocephalic artery is found in cases where the brachiocephalic trunk is absent (*see* Table).

Though in the above-mentioned text-books the costo-cervical, deep cervical, and vertebral arteries are described as arising from the right side of the brachiocephalic artery, we have not always found this to be so in the course of our investigation. The mentioned arteries arose in eleven horses from the brachiocephalic artery, whereas in twenty-five horses they arose from the beginning of the right brachial artery at a distance of *ca.* 1 cm. from one another. In our last case the brachiocephalic artery was quite free and did not give off any branches. Therefore the right side of the brachial artery must be considered to be the principal origin of the costo-cervical, deep cervical, and vertebral arteries, but not of the brachiocephalic artery, as it is described in the hitherto existing text-books.

The costo-cervical and deep cervical arteries may arise by a common stem or separately; this depends upon whether we consider the right or left side of the animal (*see* Table II). On the right side, in two horses, they arose from the brachiocephalic artery separately, and by a common trunk in nine horses; from the right brachial artery, separately in two horses, by a common trunk in nine horses. We therefore obtain for the right side: separately in 16.6 per cent. and by a common trunk in 83.3 per cent. of our cases. On the left side they arose from the left brachial artery separately in twenty-seven horses (75 per cent.), by a common trunk in nine horses (25 per cent.). Accordingly the mentioned arteries arose on the right side in most cases by a common trunk (83.3 per cent.), but on the left side separately (75 per cent.).

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The whole length of the common trunk varies considerably, but it is usually longer on the right side than on the left. A common trunk for the vertebral and deep cervical arteries, as described by Ellenberger-Baum, has not been observed in the course of our investigation. We have also not observed the costo-cervical artery beginning from the brachiocephalic trunk. The sex of the horse does not seem to influence the origin and ramifications of the arteries.

According to Schmalz,[4] the conception of the ascending aorta is quite different in a human body and in horses. In a human body the blood vessels of the upper part of trunk arise from the aortic arch by three separate trunks, and the ascending aorta is, therefore, not a branch of the trunk of aorta, but its beginning, *i.e.*, its ascending part, whilst its descending part is called the descending aorta. But since in horses these arteries arise from the aortic arch by a common trunk in the direction of the neck, their common trunk is called the ascending aorta. This explanation, given by Schmalz, concerning the ascending aorta, has been differently understood in anatomical text-books, and the authors therefore do not give a uniform definition of the ascending aorta in horses. But the explanation given by Schmalz is no longer justified, since our investigation has shown that the arteries of the upper part of trunk do not always arise from the aortic arch by a common trunk, but they may also arise by two separate trunks. From the point of view of comparative anatomy the definition of the ascending aorta is based upon the human body. Since the arteries of the upper part of trunk do not always arise from the aortic arch in horses, and their origin, therefore, varies and is similar to that of pigs, in which it is defined in the same way as for the human body, the definition of the ascending aorta in horses must also be based on principles of comparative anatomy. We may, therefore, say that the ascending aorta in horses is the ascending part of the trunk of aorta till its curve and till the origin of the arteries of the upper part of the trunk.

TABLE I

No. of Obser-tions.	Length in cm.	
	Brachiocephalic Trunk.	Brachio-cephalic Artery.
1	9	3
3	7–8	4–5
19	5–6	5–6
9	3–4	5–7
1	1–2	8
3	8.3%	9–10

TABLE II

The Costo-cervical and Deep Cervical Arteries arise from			
Brachio-cephalic Artery.	Right Brachial Artery	Separ-ate.	With Trunk
11	—	2	9
—	25	4	21
—	Left bra-	27	9
—	chial 36	—	—
—	—	—	—
—	—	—	—

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Abstracts of Current Literature

The Diagnosis of Swine Fever. By O. WALDMANN. *Bull. off. internat. des Epizooties*, Vol. VI., *ex Rev. Vet.*, January, 1934.

HÆMORRHAGE is the preponderating lesion of hog cholera. This lesion may be met with in all the organs. "On histological examination one finds in the pre-capillary and post-capillary veins very marked lesions of a progressive and regressive nature, in the different organs and according to their structure, which are accompanied by entirely different parenchymatous lesions."

In the lymphatic glands one finds a hyperplasia of endothelial or adventitious cells or lesions of regressive hyalinisation, of thrombosis or even necrosis of the vascular walls. Similar lesions in kidney, except at the level of the glomeruli. Frequent hæmorrhages of the bladder are shown as a capillary subepithelial network. Anæmic and mixed infarctions of the spleen precede hyaline necrosis and thrombosis of the follicular arteries. In the nervous system, without marked predilection (brain and lumbar marrow), the vessels present tumefaction of the endothelium, cellular infiltration of the external layers, and finally perivascular muffs.

Research into these lesions may aid diagnosis where experimental diagnosis in effectives with acute or chronic swine fever is faulty in 50 per cent. of cases. Besides, there is the inconvenience of the long period of time in carrying this out. Histologic lesions to establish diagnosis ought to be sought for in at least three peripheral glands, and in the nervous centres (brain and lumbar marrow). These organs ought to be taken out as soon as possible after death or slaughter. Thus research has enabled us to decide cases of swine fever in which facts drawn from the epidemiology, from clinical, anatomical and experimental symptoms have not permitted us to come to any conclusion.

For the diagnosis of chronic swine fever in practice, Waldmann, from his research work, draws the following deductions: (1) We consider chronic swine fever is present in subjects when, after several doubtful autopsies, the inoculation

test on the animal is positive, that is to say, when inoculated animals die or, after delayed observation, show themselves to be undeniably immunised. (2) We consider as negatives cases in which, in the examination of two animals or less, the results of autopsy are doubtful, the histological lesions are defective, and the inoculation test on the animal is negative. (3) In doubtful cases, after one or several examinations at autopsy, and histological lesions also in one or several organs are doubtful, we seek to obtain diagnosis by repeated examinations.

[From these observations it would seem that in certain cases swine fever is not by any means easy to diagnose—TRANSLATOR.]

Adrenalin in the Treatment of Chronic Bronchitis of the Dog.—PATOUT. Thésis Toulouse.

IN the course of the evolution of chronic bronchitis in the dog, various complications occur which aggravate the lesions and enfeeble or kill the subjects. The principal are œdema of the lung, exudative bronchitis, and, above all, dyspnœic crises of a violent nature due to upsetting of the vago-sympathetic equilibrium. Against these disturbances the author recommends the daily subcutaneous injection of 1 c.c. of a 1 in 1,000 solution of adrenalin. Injected thus, adrenalin, even in prolonged use, does not cause vascular lesions, nor anæmia of the liver or brain.

Reviews

Ostertag's Text-Book of Meat Inspection. Translated by C. F. MARSHALL, M.Sc., M.D., F.R.C.S., and Edited by T. DUNLOP YOUNG, O.B.E., M.R.C.V.S., D.V.S.M. Pp. xi + 743. Ten coloured plates, 247 figures in the text. London: Baillière, Tindall & Cox. Price 45*s*.

Dr. Robert Ostertag's classical "Handbook of Meat Inspection" has for many years been awarded the premier place, not only as the text-book for the veterinary student, but also as the last word when an authoritative opinion was required concerning anything relating to the inspection and diseases of meat. On account, however, of our lamentable backwardness in not having a properly organised veterinary meat inspection service in this country, with its necessary legal administrative laws to enforce the same, Ostertag's text-book was looked upon more as a work of reference which gave in all completeness the methods of Germany and other advanced countries, but did not quite apply, in its legal details at any rate, to the slipshod methods of meat inspection adopted in Great Britain. Now that Scotland has given a lead, and England is beginning to wake up, the book will have a very valuable mission to fulfil; especially as this present edition under review is not only translated into English (and for the efficient manner in which this is done we owe a debt of gratitude to our medical colleague, Dr. C. F. Marshall), but is also edited and adapted to the scope of our British laws by the best authority the publishers could have selected, Colonel T.

Dunlop Young, who for so many years occupied the important position of Chief Veterinary Inspector to the City of London.

To attempt to review the authoritative work of Ostertag would be like " painting the lily." His position of authority in his own country, and indeed every country of the civilised world, is such a firm one that it is indisputable ; and the book which is translated here to-day is the result of his life's work. Written in a lucid manner, even where occasionally technical and pathological terms are made use of, it is readily understandable to the student ; and, indeed, it is indispensable as a class text-book. It is incomprehensible that a fourth or fifth year student can pass his final examination without its aid, and no practitioner's bookshelf is complete without a copy. For the private practitioner, even although not holding a Public Health post, it is full of every-day interest, even if only looked at from the point of view of its pathological hints for post-mortem examinations ; and as regards the specific value from the meat inspector's point of view, the adaptation by Colonel Dunlop Young to our Meat Regulations, together with the practical editorial notes and comments which his lifelong experience has enabled him to make, Ostertag's " Meat Inspection " makes the best text-book, not only for Great Britain and her Colonies, but for the whole English-speaking world. Owing perhaps largely to the want of remunerative return, British veterinary publications have of late years been very few, but one may prophesy safely that the publishers have selected " a winner " this time, and have placed before the veterinary profession a book whose text and illustrations can hold its own with any other from any part of the world.

Poultry Ailments. By W. P. BLOUNT, F.R.C.V.S., *Pathologist, Poultry Health Laboratories, Limited, etc.* ; with a Foreword by CHAS. CROWTHER, M.A. Oxon., Ph.D. Pp. 289, with Glossary ; 30 Illustrations in text. London : Poultry World, Ltd., 1904. Price 5*s.* net.

The author states that his main object in writing this book is to enable intelligent poultry keepers to understand and interpret post-mortem reports, which are often necessarily technical. If read through carefully by the average layman we think he will gain some very useful knowledge. Part I consists of thirteen chapters, and is devoted to the management, anatomy and physiology of fowls, post-mortem reports, the transmission of disease from poultry to other animals, and disinfection. In the case of this last, we think mention might have been made of the use of the painter's blow lamp. The short lines on soil disinfection are very timely.

Part II is occupied with the diseases of poultry, and consists of six chapters. The importance of blood testing in outbreaks of pullorum disease is indicated and explained. If this work is done through a scientific laboratory there is no doubt much progress can be made. Unfortunately it does not seem to be at all general in the poultry world, and we are constantly receiving chicks dead of B.W.D. that the writers declare are from blood-tested stock. As regards worms in poultry, we see no mention of tobacco dust as a remedy. We have frequently received congratulatory reports from clients who have used it with benefit, especially when the ground is sprayed with a good disinfectant at night when the birds are housed. The pages on coccidiosis, roup and contagious catarrh are well worth perusal and show evidence of the conclusions of a very careful observer. Mr. Blount believes that sour milk is about the best remedy for coccidiosis, and Heelsbergen (*Geflugelkrankheiten und Geflugelzucht*, 1929) pins his faith to lactose (two parts by weight to three of morning food) after experimenting with almost innumerable remedies. The glossary at the end of the book is

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of real use to the non-professional reader. We think Mr. Blount may be congratulated on producing very nearly a pioneer work by a member of our profession on poultry diseases in this country. Its circulation ought to be numerous, and as a guide and instructor to the huge army of poultry keepers it can be highly recommended.

Personal

Mr. Sydney D. Abbott, M.R.C.V.S., D.V.S.M., the Chief Veterinary Inspector for the County of Renfrew, has been appointed to the position of Veterinary Inspector to the Corporation of the City of Glasgow.

This position, which has been so ably held for many years by Mr. Trotter, whose good work for the profession has done so much to stabilise the value of a veterinary surgeon as the expert adviser on meat and milk, and, indeed, all questions pertaining to animal products used for the food of man, is one of the most important of the positions of this kind in the United Kingdom. Mr. Abbott has a distinguished career behind him, and the years since college have been wisely occupied. Graduating with honours from the Glasgow College in 1923, and subsequently taking the Diploma in Veterinary State Medicine, he took up the appointment of Assistant Veterinary Inspector to the corporation of Sheffield, being appointed examiner in meat infections to the Royal Sanitary Institute. Seeking more variety in Public Health duties, Mr. Abbott left this post to take up the Veterinary Inspectorship of West Lothian, and finally that of the County of Renfrew. It will rest with him now to carry on the work for the profession for which his predecessor, Mr. Trotter, has laid such a firm foundation.

ANTHRAX IN BELFAST.

The prompt measures which were taken in detecting and dealing with a case of anthrax in a cow whose carcase from an outside source was submitted for inspection by Mr. McLean, M.R.C.V.S., D.V.S.M., the Veterinary Inspector of the Belfast abattoir, demonstrates again the value of placing a qualified veterinary surgeon in charge of all positions where an expert knowledge of the diseases of animals is so essential for the protection of the public.

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